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North Carolina Department of Transportation
Division of Planning and Environment
Statewide Planning Branch

LINCOLNTON THOROUGHFARE PLAN STUDY AND REPORT

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DECEMBER 1998

TRANSPORTATION PLAN

For

LINCOLNTON, NORTH CAROLINA

Prepared by:

Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In Cooperation with:

City of Lincolnton
Federal Highway Administration
U. S. Department of Transportation

1-18-99

Gerald R. Dudeck, P.E.
Transportation Planning Engineer

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Persons Responsible for this Report:

Statewide Planning Branch Manager	Marion R. Poole, Ph.D., P.E.
Assistant Branch Manager	A. Blake Norwood, P.E.
Thoroughfare Planning Engineer	Gerald R. Dudeck, P.E.
Transportation Engineer	Jerry G. Hayes, P.E.
Transportation Engineer	Pam R. Cook
Engineering Technician	Charles E. Tew

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I. INTRODUCTION

This report documents the findings of a study of the City of Lincolnton Transportation System. (See Figure 1 for the general location of the City of Lincolnton.) This study was initiated in September, 1992, and culminated in the mutual adoption of an updated thoroughfare plan on December 6, 1996. (Shown in Figure 2 on a map dated July 11, 1996).

The purpose of this study was to re-examine the present and future transportation needs of the Lincolnton planning area, and from this to derive a revised thoroughfare plan for the City. The system of thoroughfares proposed was developed following the principles of thoroughfare planning outlined in Chapter II of this report.

Recommended cross-sections are based on existing conditions and the expected volume of traffic in Future Year 2020. Every effort was made to use as much of the existing street system as possible in order to minimize cost and environmental disruption. Location of new facilities was based on field investigation, existing land use, and topographic conditions.

Initiative for thoroughfare plan implementation rests with State and local government policy boards as well as citizens in the Lincolnton area. Total costs of highway needs throughout the State exceed available funding. Therefore, local government should aggressively pursue funding for desired projects.

Responsibility for proposed construction is shared by the City of Lincolnton and the North Carolina Division of Highways. With the different governmental agencies involved in providing various elements of the plan, coordination of activities is of prime importance. The Lincolnton Thoroughfare Plan, formally adopted by appropriate local governing bodies as well as the North Carolina Board of Transportation, is to serve as a mutual official guide in providing a well coordinated, adequate, and economical major street system. In order for the Thoroughfare Plan to be effective, the City and the State must procure in advance or protect by various legal controls the necessary rights-of-way for ultimate improvements.

It must be emphasized that this Thoroughfare Plan was based on anticipated growth of the urban area as projected by the City of Lincolnton in conjunction with the North Carolina Division of Highways. Since actual growth rates and patterns may differ from those anticipated, it may become necessary to accelerate or slow the development of thoroughfares or to make revisions in the proposed Thoroughfare Plan. It is desirable to review the Plan in detail approximately every ten years at which time the thoroughfare system can be adjusted to reflect the actual type and rate of growth of development.

GEOGRAPHIC LOCATION FOR LINCOLNTON NORTH CAROLINA

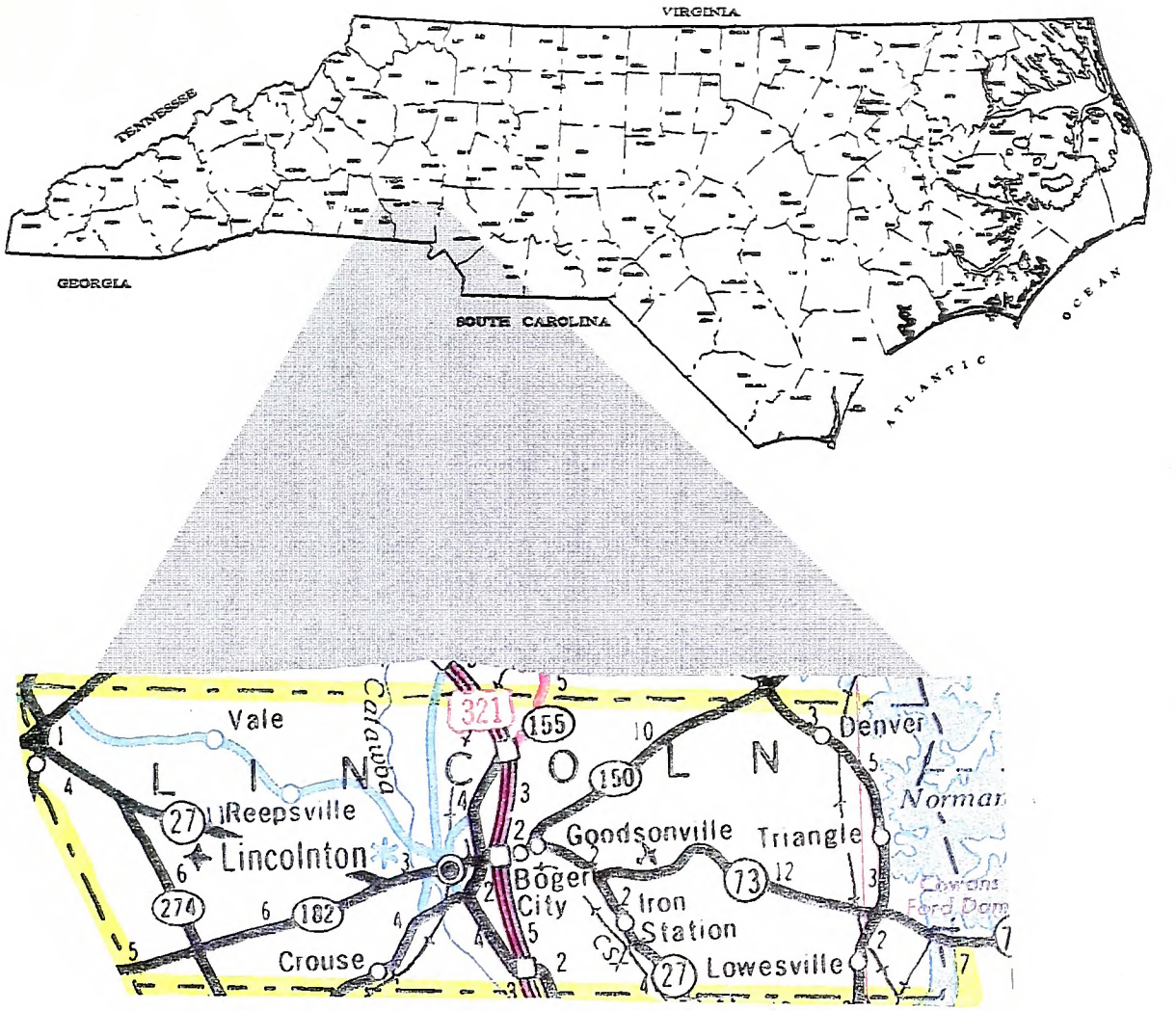

FIGURE 1

LINCOLNTON URBAN AREA THOROUGHFARE PLAN

JULY 11, 1996

LEGEND

	EXISTING	PROPOSED
FREEWAY		
MAJOR THOROUGHFARE		
MINOR THOROUGHFARE		
INTERCHANGE		
GRADE SEPARATION		

ADOPTED BY:

CITY OF LINCOLNTON:	JULY 11, 1996 NOVEMBER 7, 1996
RECOMMENDED BY STATEWIDE PLANNING BRANCH:	NOVEMBER 12, 1996
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION:	DECEMBER 6, 1996

FIGURE 2

LINCOLNTON

LINCOLN COUNTY
NORTH CAROLINA

PREPARED BY
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 1000' 2000' 3000' 4000' 5000'

APPROX. SCALE

0 .5M 1 M

1 INCH = 2000 FT

II. TRANSPORTATION PLANNING PRINCIPLES

Basic Principles

The urban street system typically occupies 25 to 30 percent of the total developed land in the urban area. Since the system is permanent and expensive to build and maintain, much care and foresight are needed in its development. Thoroughfare planning is the process used by public officials to assure the development of the most logical and appropriate street system to meet future travel desires. The major steps involved in the thoroughfare planning process are:

1. Collection of data concerning existing physical development and travel desires within the area.
2. Development of a (computer) model which reflects present travel desires.
3. Prediction of future socio-economic data, and computation of future travel desires using the computer model.
4. Evaluation of the adequacy of the existing street system in serving present and future travel.
5. Formulation of the best thoroughfare plan, on the basis of travel demand, economic benefits, and environmental considerations, to meet future travel desires.
6. Development of construction priorities for plan implementation.
7. Implementation of the plan.

Purpose of Planning

There are many benefits to be gained from thoroughfare planning, but the primary objective is to assure that the street system will be progressively developed in such a manner as to adequately serve future travel desires. Thus, the cardinal concept of thoroughfare planning is that provisions be made for street and highway improvements so that as needs arise, feasible opportunities to make improvements exist.

Some of the benefits derived from thoroughfare planning are: (1) Each street can be designed to perform a specific function. This permits savings in right-of-way and construction costs; and encourages stability in travel and land use patterns. (2) Local officials and citizens are informed as to future improvements. Public facilities can be better located; and damage to property and appearance can be minimized (for example: buildings and plants can be located to permit future street widening). (3) Residents will know which streets will be developed as major thoroughfares and be able to make an informed decision when choosing a home. (4) City officials will know when improvements will be needed and can schedule funds accordingly.

Objectives of Thoroughfare Planning

The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and it helps eliminate unnecessary improvements, so needless expense can be averted. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial, and industrial development affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

1. providing for the orderly development of an adequate major street system as land development occurs,

2. reducing travel and transportation costs,

3. reducing the cost of major street improvements to the public through the coordination of the street system with private action,

4. enabling private interests to plan their actions, improvements, and development with full knowledge of public intent,

5. minimizing disruption and displacement of people and businesses through long range advance planning for major street improvements,

6. reducing environmental impacts, such as air pollution, resulting from transportation, and

7. increasing travel safety.

Thoroughfare planning objectives are achieved by using both construction and non-construction methods to improve traffic conditions on existing thoroughfares and by improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry more vehicular traffic and people and goods. In terms of vehicular traffic, a street's capacity is defined by the maximum number of vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

There are several different approaches to increasing the capacity and reducing congestion on a roadway. In 1992, the Institute of Transportation Engineers (ITE) published a report entitled "A Toolbox for Alleviating Congestion." This publication lists proven strategies for dealing with traffic congestion. Following the format developed by ITE's Toolbox, the menu of options has been broken down into the categories of improved efficiency of the existing system, adding new capacity, transit service improvements, and transportation demand management. A detailed explanation of each strategy, and its effectiveness, is listed below.

Efficiency Improvements

Freeway Incident Management

Freeway incident management involves the pre-planned coordination of personnel, equipment, and materials with the goal of reducing incident detection, response, and clearance time. Incident management programs utilize various combinations of strategies and technologies in achieving this goal. Some of these strategies include: roving service vehicles, motorist aid call boxes, dedicated cellular phone lines, incident management teams, motorist information systems, traffic diversion techniques, and alternate route identification. Incident management technologies include traffic surveillance systems that incorporate mainline detectors, variable message signs, closed-circuit television, advanced communications systems, and highway advisory radios.

Surveillance and Control Systems

These systems are designed to be demand responsive and change traffic control according to traffic volumes on roadways. Often surveillance and control systems combine ITS technologies with sophisticated signal timing packages used in conjunction with computerized signal systems. The latest software packages are capable of devising and implementing a customized timing plan for the site conditions.

Motorist Information Systems

Variable message signs, highway advisory radio, or other technologies can be used to provide information to the motorist on congested routes, traffic incidents, roadway construction, or alternate routes helping them to anticipate and avoid congested locations.

Ramp Metering

Ramp metering is the use of a modified traffic signal placed at the end of a ramp to allow traffic to enter the freeway either at pre-timed intervals or according to existing traffic volumes on the ramp or the highway. The merging traffic experiences increased delay; however, the mainline experiences an increase in speeds and a decrease in the number of accidents.

Adding Lanes Without Widening

Reducing the lane width on existing lanes to provide an additional travel lane can increase the capacity of an existing facility. This solution is limited to facilities with existing wide travel

lanes and relatively low speeds.

High Occupancy Vehicle Lanes (HOV)

This involves designating existing traffic lanes for exclusive use by high occupancy vehicles like carpools, vanpools, and buses. These can be altered according to demand to increase capacity. For example, some HOV lanes can be designated HOV only during peak hours and/or HOV lanes can be reversible between the morning and afternoon peak hours to reflect the shift in directional flow of traffic.

Traffic Operational Improvements

This strategy involves the upgrading of major arterials to improve traffic flow and to eliminate as many at grade crossings as possible. Additional measures that improve traffic flow on a more localized level include: traffic channelization, street and intersection widening, exclusive turn lanes, turn prohibitions, one-way streets, reversible traffic lanes, railroad grade separations, upgrading traffic control devices, parking removal, lighting improvements, and bus turnout bays.

Traffic Signal Improvements

Traffic signal improvements are aimed at improving the traffic flow along arterials. These improvements can include updating equipment, revising timing plans, interconnected or computerized signal systems, and removal of unwarranted signals. Developing a regular signal maintenance plan can also optimize existing signalized intersections.

Arterial Management

Arterial management involves the development of surveillance and management strategies to better manage the existing arterial street system. Various strategies include incident management, intersection surveillance and monitoring, parking control and management, integration of freeway and arterial management, and traffic surveillance and metering. These strategies are defined under the individual topic headings.

Arterial Access Management

By developing policies that regulate access onto major arterials, it is possible to improve average travel speeds and capacity of arterials. Strategies for managing access include: physical restriction of left turns, restricting curb cuts and direct access driveways, separating obvious conflict areas, eliminating parking, minimal intersection locations and construction of frontage roads.

Intersection Improvements

Intersection improvements incorporate the use of various traffic control devices to improve the flow of vehicles and the safe passage of pedestrian traffic. These devices include stop signs,

yield signs, traffic signs, turning lanes, traffic islands, channelization, and improved design.

Turn Prohibitions

Turn prohibitors reduce turn conflicts, congestion, and accidents by eliminating certain intersection turn movements, primarily during peak hours.

One-Way Streets

The use of one-way streets can be beneficial in reducing congestion along parallel routes that have high traffic volumes and numerous vehicle conflicts. The capacity of a street can sometimes be increased 20-50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. Suitable conditions for one-way streets are generally found in central business districts or other activity centers.

Reversible Traffic Lanes

Reversible lanes are useful on routes with high peak hour directional traffic flows, reversible traffic lanes provide additional capacity in the direction of the heaviest traffic flow. The reversible lane system designates one or more lanes for flow in one direction in the a.m. and the other direction of flow in the p.m.

Improved Traffic Information Devices

Upgrading traffic control devices provides better information to the driver and can be beneficial in reducing traffic congestion by reducing driver confusion and uncertainty.

Parking Management

A parking management program is a plan for providing, controlling, regulating, or restricting parking space. In alleviating congestion, parking policies can serve to discourage auto usage and promote mode shifts such as increased transit use. Such parking policies are not likely to be useful on a wide-spread suburban network; however, there might be some application in larger cities that still have a concentrated work force in the Central Business District.

Goods Movement Management

Transportation systems not only move people, but goods as well. While trucks make up a small fraction of the total vehicles on the typical urban road system, they sometimes contribute disproportionately to the congestion. Congestion can be reduced on some roads by management of time and location of truck deliveries and pickups. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) placed an increased emphasis on the relationship between the movement of goods and the overall efficiency of the transportation network. Ways to decrease delay to vehicles carrying goods include improving efficiency on intermodal links, improving

accessibility to various modes of transport, and designating corridors for use by major modes of goods transport. Rail and water transport can greatly impact the highway system.

Intelligent Transportation System

Intelligent Transportation System (ITS) is not a single system or service, but rather a range of interrelated services that can be implemented over time. ITS has been divided into five areas: Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), and Commercial Vehicle Operations (CVO). These strategies involve technological improvements designed to optimize the existing transportation system.

a. Advanced Traffic Management System - Provides real- time adjustment of traffic control systems and real- time means for transportation operators to effectively monitor traffic conditions and communicate to devices, quickly adjust traffic operations, and promptly respond to incidents.

b. Advanced Traveler Information System - Provides continuous advice regarding traffic conditions, alternate routes, and warnings regarding road safety.

c. Advanced Vehicle Control - Vehicle and/or roadway based electromechancial and communication devices that enhance the control of vehicles by facilitating and augmenting driver performance and ultimately relieving the driver of most tasks on designated instrumented roadways.

d. Advanced Public Transportation System - Providing mass transport users and operators (e.g. buses, vanpoolers, high-occupancy vehicle lanes, carpools, taxicabs) with real time information on status, schedules, and availability of public transit systems including automatic vehicle location and monitoring systems to improve fleet management as well as electronic fleet media.

e. Commercial Vehicle Operations - Improves operations efficiency and productivity of trucks, buses, and other fleets of vehicles and improves the efficiency of necessary regulatory activities.

Measures to Increase Capacity

New Highways

The construction of new highways on new location is an effective method for relieving traffic congestion on the existing transportation system.

System Improvements

Congestion is often caused by an inefficient street system. Travel demand on a facility can be altered by developing a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system. Functional classification will be discussed in more detail later in this chapter.

Access Control and Management

Congestion can be managed through the designation of highways into functional classifications that are based on the level of access provided on the facility. Facilities are designated and protected from the most restrictive to the least restrictive. The most restrictive facilities are designed primarily to provide mobility whereas the least restrictive are designed primarily to provide access to abutting property.

Geometric Design

Improving the geometric design of roadways can significantly improve operations and traffic flow, resulting in reduced congestion. Design improvements are based on specified design criteria, traffic volumes, speed, and sight distance. Geometric design improvements can include improvements to the horizontal/vertical alignment, greater clearance, adding to the number and width of lanes, widening shoulders, deleting or improving median crossovers, improving traffic control devices and improved intersection design. Geometric improvements typically provide high benefit/cost ratios.

Reconstruction

Roadway capacity can be increased by reconstructive efforts that improve the roadways geometric and structural standards, improve the quality of operation and safety, and by improvements that extend the life-span of the facility.

Roadway Widening

Capacity can be increased through the addition of new lanes or the widening of existing lanes. Drivers perceive wider lanes to be safer and will therefore travel at higher speeds reducing slow downs and bottlenecks. The addition of new lanes greatly increases the vehicle-carrying capacity of the facility.

Road Grade Separation

The physical separation of intersecting facilities eliminates traffic conflicts, and can substantially increase the capacity of intersections or roadways, thereby reducing congestion and enhancing safety.

Railroad Grade Separation

Safety and operations can be improved at railroad crossings through physical grade separation or, in some cases, closing railroad crossings.

Transit Service Improvements

Service Improvements

Improving and upgrading the buses in a transit system can result in better service. Also, an in-depth route analysis can reveal inefficiencies in transit service. Measures can then be taken to reconfigure routes to reduce headways and enhance transit service.

Fixed Guideway Transit Construction

Improving transit service through the construction of heavy rail transit, light rail transit, commuter rail transit, or a transitway is a means of moving large numbers of persons in a fast, efficient, and reliable manner.

Fixed Route and Express Bus

Fixed route service operates on a regularly scheduled route, picking up and discharging passengers at specified locations. Express service is a variation of fixed route service in that a portion of the route is operated without any stops. Express service is attractive for an area that has a large number of commuters in outlying suburban areas who desire fast service to a major employment center.

Paratransit and Ridesharing

Paratransit refers to a service that is not rail, fixed guideway or fixed route bus service. This service includes strategies such as carpooling, vanpooling, subscription bus, shared-ride taxi or route-deviation services. Paratransit services provide a travel mode option for low density areas with highly dispersed travel.

Land Use Polices to Improve Transit Access

This option refers to the establishment of land use policies that promote transit use as a means of reducing congestion through auto trip diversions to transit. Examples of such policies include density requirements, requirements for the construction of public transportation facilities, and zoning/planning regulations.

Site Design Criteria that Increase Transit Usage

Requiring that site designs incorporate transit access can be an effective measure in mitigating traffic congestion.

Transit-Oriented Parking Management Strategies

This congestion management strategy encourages transit use or other alternatives to the single occupancy vehicle through the utilization of parking management strategies. Free or inexpensive parking is the major disincentive to increasing the use of alternate modes.

Employer Initiatives that Encourage Transit Use

There are four major initiatives employers can implement to reduce congestion. These include: incentives that encourage ridesharing, carpools, and vanpools; capitalizing on tax write-offs for employee transit subsidies; instituting flex-time programs; and participating in transportation management associations.

Transportation Demand Management

Growth Management

Public policy can be used to regulate the location, pattern, density, and rate of growth of development. Growth regulations are tied to the capacity of the existing system. The growth management strategy controls congestion by restricting development unless a means to mitigate congestion impacts is proposed and implemented.

This type of policy could be applied to corridors identified in a Congestion Management Plan. New developments with the potential to cause congestion to increase beyond predetermined thresholds for a facility can be required to implement strategies to prevent such increases in congestion.

An example of a growth management policy would be: "A traffic impact analysis would be required for any project that generates more than 500 vehicle trips per day. Where it is projected that additional traffic from a project will exceed a volume/capacity ratio of 0.8 on the adjacent streets, increase the peak hour volume by 10% or more, or reduce the level of service to "D" or below, the project shall not be approved unless and until provision has been made for the improvement of said condition."

Studies have shown that urban areas should add macro-level land development decisions to the tool box for congestion management. Macro level studies look at regional impacts of urban form alternatives (such as whether to have concentrated employment centers, or to spread them out to many small activity centers).

Road Pricing

Road pricing encourages motorists to change their travel behavior by attaching a cost to the use of a roadway.

Auto Restricted Zones

Auto restricted zones refer to any land area where vehicular traffic is regulated, controlled or restricted. The goal of auto restricted zones is to preserve and enhance the vitality of urban centers, to improve the environmental quality in urban centers, and to encourage the use of non-auto modes.

Demand Management Agreements

Demand management agreements mandate that, regardless of the congestion level on an adjacent street, as a condition of development plan approval, the private sector must implement specific traffic mitigation strategies.

Ridesharing

A key element of demand management, ridesharing refers to the sharing of a vehicle by more than one person. Ridesharing commonly involves carpooling and vanpooling.

Alternative Work Schedules

By encouraging employers to allow alternative work schedules for their employees, the demand for travel can be altered. This can result in fewer cars on the roadways during the peak hours of travel. Alternate work schedules include such strategies as staggered hours, flex time or variable time, four-day work weeks, and telecommuting.

Trip Reduction Ordinances

Trip reduction ordinances regulate the number of trips that can be produced by new development.

Thoroughfare System Classification

Streets perform two primary functions -- traffic service and land service, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely used abutting property leads to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets which permits travel from origins to destinations with directness, ease, and safety. Different streets in the system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict. Streets are categorized as to function as local access streets, minor thoroughfares, or major thoroughfares (See Figure 2).

Local Access Streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins and destinations on the streets would be served. Local streets may be further classified as either residential, commercial, and/or industrial depending upon the type of land use which they serve.

Minor Thoroughfares are more important streets on the city system. They collect traffic from local access streets and carry it to the major thoroughfares. They may in some instances supplement the major thoroughfare system by facilitating minor through traffic movements. A third function that may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major Thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and inter-city traffic. The streets which comprise the major thoroughfare system may also serve abutting property, however, their principle function is to carry traffic. Therefore, direct property access should not be permitted on major thoroughfares. They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic and each driveway is a danger and an impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfares forms the basic framework of the urban street system, thus improving system efficiency through layout. A major thoroughfare system which is most adaptable to desire lines of travel within an urban area is the radial-loop system. It permits movement between various areas of the city with maximum directness. This system consists of several functional elements--radial streets, crosstown streets, loop system streets, and bypasses which are illustrated in Figure 3.

Radial Streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of **crosstown streets** which form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other side to follow the area's border. It also allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a business or pedestrian shopping area.

Loop System streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area. They are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A **Bypass** is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing traffic which has no desire to be in the city. Bypasses are

usually designed to through-highway standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, a thoroughfare plan is developed for established urban areas and is constrained by the existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these constraints and the many other factors that affect major street locations.

Throughout the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are as follows:

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, as well as the factors that contribute to it, limit it, and modify it.

2. Traffic demands must be sufficient to warrant the designation and development of each major street. The transportation plan should be designed to accommodate a large portion of all major traffic movements on a relatively few streets.

3. The plan should conform to and provide for the land development plan of the area.

4. Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas which have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights of way for future thoroughfare development.

5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

IDEALIZED THOROUGHFARE PLAN

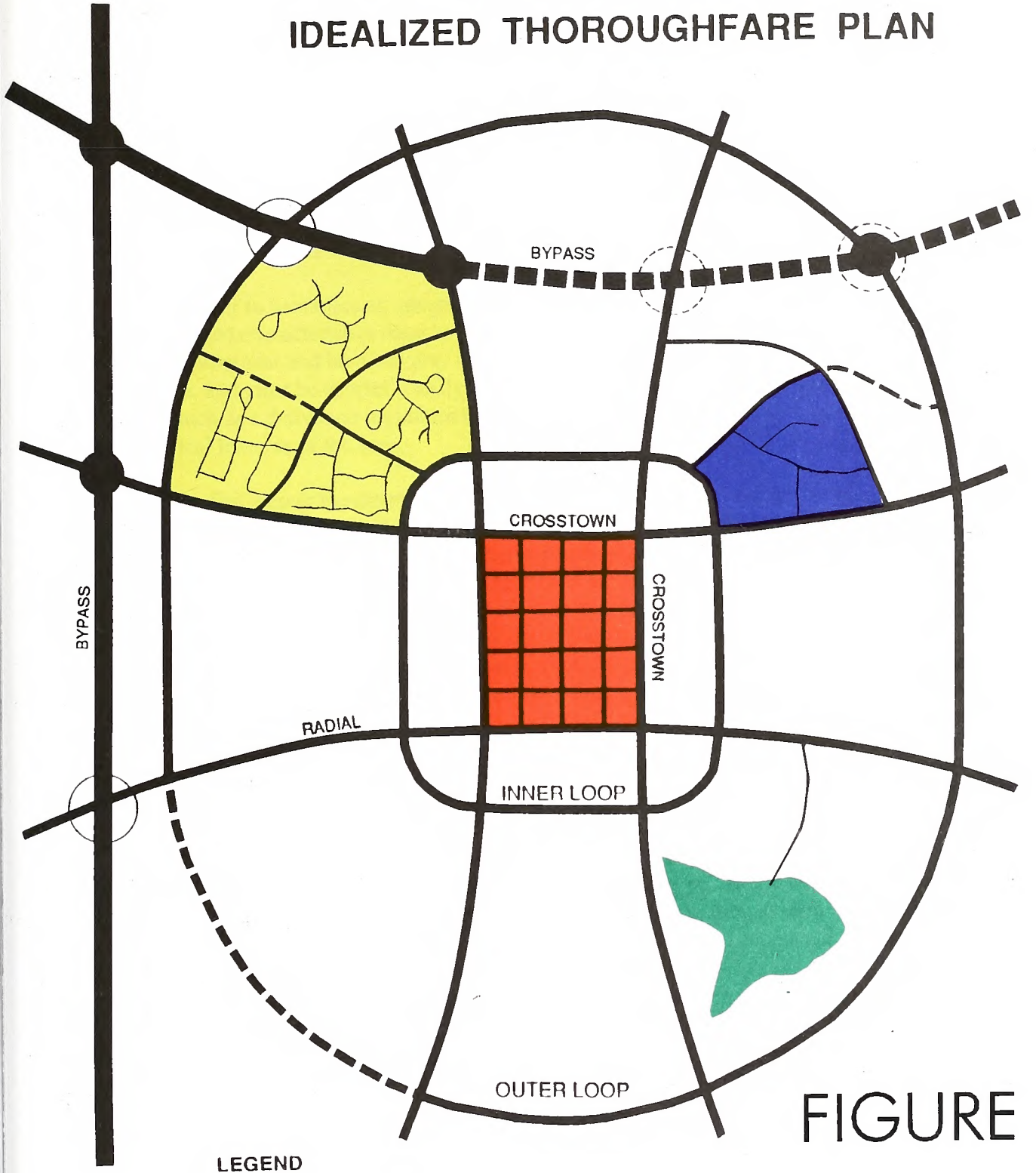

FIGURE 3

LEGEND

EXISTING PROPOSED

JOR THOROUGHFARE
EEWAY

AJOR OTHER

NOR THOROUGHFARE

CAL ROAD

TERCHANGE

RADE SEPERATION

LAND USES

COMMERCIAL/BUSINESS

RESIDENTIAL

INDUSTRIAL

PUBLIC/INSTITUTIONAL

III. Population, Land Use, and Traffic

Factors Affecting Transportation

The factors of population, land use, employment and traffic play a vital role in determining the transportation needs of a city. Examination of these factors helps to explain historic travel patterns and lays the groundwork for thoroughfare planning.

In order to formulate an adequate Future Year 2020 thoroughfare plan, reliable forecasts of future travel characteristics must be achieved. The factors of population, vehicle usage trends, employment and land use play a significant role in determining the transportation needs of the area, and must be carefully analyzed. Additional items may include the effects of legal controls such as subdivision regulations and zoning ordinances, availability of public utilities and physical features of the area.

The first step in the development of the Thoroughfare Plan is to define the planning period and the planning area. The planning period is typically on the order of 25 years. The base year for the Lincolnton study is 1992, and future year 2020 was chosen to be the end point of the study period (28 years). The planning area is generally the limits to which urbanization is expected to occur during the planning period. The planning area is then subdivided into traffic analysis zones. These are areas in which housing and employment data was counted and categorized. Then forecasts were made that predicted what the housing and employment data would be in each of these zones in the year 2020. Figure 4 shows the planning area boundary, screenlines, and zones.

Population

Travel is directly related to population. The volume of traffic on any given section of roadway is closely related to the size and distribution of the population which it serves. Because of this relationship, one of the basic steps in planning a transportation system is an in-depth population study. Population trends for the City of Lincolnton and Lincoln County are shown in Table 1.

The most important population estimate for development of the Thoroughfare Plan is that of the planning area. The 1992 housing survey for this study area gave a final count of 6,895 units. The population for this area was calculated based on overall statistical trends of estimated persons per household. Therefore, the most accurate population count for this planning area multiplies the housing count times the number of persons per household estimated for Lincolnton. (See Appendix A for housing data.)

At the time of this study, persons per household data was not available for 1990, but 2.43 persons per dwelling unit was used based on previous data and trends. Using this household occupancy rate for the Lincolnton transportation planning area, a population of 16,744 was calculated for base year 1992. Population projections are shown in Table 2.

TABLE 1		
Population Trends for the Lincolnton Planning Area		
Year	Lincolnton	Lincoln County
1950	5,423	27,459
1960	5,699	28,814
1970	5,293	32,682
1980	4,879	42,372
1990	6,847	50,319

TABLE 2			
Population Projections for the Lincolnton Planning Area			
Year	Lincolnton	Lincoln County	Planning Area
1990	5,847	50,319	N/A
1992	7,100	52,000	16,744
2010	8,450	64,000	N/A
2020	9,250	70,000	26,604

Economy and Employment

One of the most important factors to be considered in estimating the future traffic growth of an area is its economic base. The number of employers and the employee's income or purchasing power influences how much population can be supported in the area and the number of motor vehicles that will be locally owned and operated. Generally, as the family income increases so does the number of vehicles owned, as well as the number of vehicles trips generated per day by each household. An accurate projection of the future economy of the area is essential to estimating future travel demand.

Employment figures for Lincolnton show that in 1992 there were 12,436 employees. With this information the employment to population ratio was determined to be 0.74. With significant planned industrial growth projected by the City of Lincolnton, a ratio of 0.91 was used to project the year 2020 employment to 24,171. These 11,735 new jobs were distributed in the planning area based on employment trends, zoning ordinances and available acreage. (See Appendix A for Employment Data.)

LINCOLNTON ZONE MAP

LEGEND

CORDON LINE

SCREEN LINE

ZONE LINE

CORDON STATION

FIGURE 4

LINCOLNTON

LINCOLN COUNTY
NORTH CAROLINA

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 5000 10000 15000 20000 25000

0 4Km 8Km 12Km

1 KILOMETER = 3280 FT

Employment growth by type of employment is shown on Figure 6. Office and institutional employment is expected north and south of East Main Street. Commercial growth is expected along East Main Street, Aspen Street, Old US 321, new NC 150, US 321 and some sections of NC 27 east of Lincolnton. Most of the industrial development is expected to continue to the north around the proposed loop, along Industrial Park Road, near US 321 north and south, east of South Madison Street and south along Riverview Road.

Land Use

Land use refers to the physical patterns of activities and functions within the city. Nearly all traffic problems in a specific area are relative to the area's land use. The amount of traffic on a particular street is very closely related to its adjacent land use. For example, a large industrial plant might be the cause of congestion during shift change hours as its workers come and go. However, during the remainder of the day little, if any, problems might occur. The spatial distribution of different types of land use (sometimes referred to as traffic generators) is the predominant determinant of when, where, and why congestion occurs. The attraction between different land uses and their association with travel varies depending on the size, type, intensity, and spatial separation of each.

For use in transportation planning, land uses are grouped into four categories: (1) Residential - all land devoted to the housing of people with the exception of hotels and motels; (2) Commercial - all land devoted to retail trade including consumer and business services and offices; (3) Industrial - all land devoted to manufacturing, storage, warehousing, and transportation of products; and (4) Public - all land devoted to social, religious, educational, cultural, and political activities. Figure 5 shows the planning area's Base Year 1992 existing land use.

Anticipated future land use is a logical extension of the present spatial distribution. Determination of where expected growth is to occur within the planning area facilitates the location of proposed thoroughfares. Areas of anticipated development and growth for the Lincolnton planning area are:

Residential - A large amount of Lincolnton's current residential land development is located on the northeast and eastern sections of the town. With the new US 321 Bypass now in operation, there is much potential for residential development along the US 321 corridor particularly southeast and north of the City of Lincolnton.

Commercial/Retail - Most of the commercial development is located (1) along existing East Main Street from the downtown business district eastward to NC 150 and NC 27 junction, and (2) along NC 155 (Old US 321). It is anticipated that commercial development will continue to spread along these two corridors and near interchange locations along US 321 Bypass. NC 150 relocation will also encourage commercial growth south of Lincolnton.

Industrial - The City of Lincolnton has a large industrial employment base with the majority being furniture manufacturing plants. Over 6400 persons are employed in manufacturing in the Lincolnton planning area. Plants manufacture furniture, textiles,

apparel, paper products, electrical components and lumber products. It is anticipated that industrial development will occur to the north and northwest of downtown, near interchange locations along US 321 Bypass, and in the southeast along NC 150.

Cultural, Entertainment, & Recreational - Downtown Lincolnton continues to be the cultural center of Lincoln County. It is the desire of the City of Lincolnton to provide for the conservation of historic architectural resources in the downtown and older residential areas. Figure 6 shows Future Year 2020 projected land use for the study area.

LINCOLNTON
BASE YEAR 1992
LAND USE

LEGEND

- RESIDENTIAL
- OFFICE/INSTITUTIONAL
- PUBLIC
- COMMERCIAL
- INDUSTRIAL

FIGURE 5

LINCOLNTON

LINCOLN COUNTY
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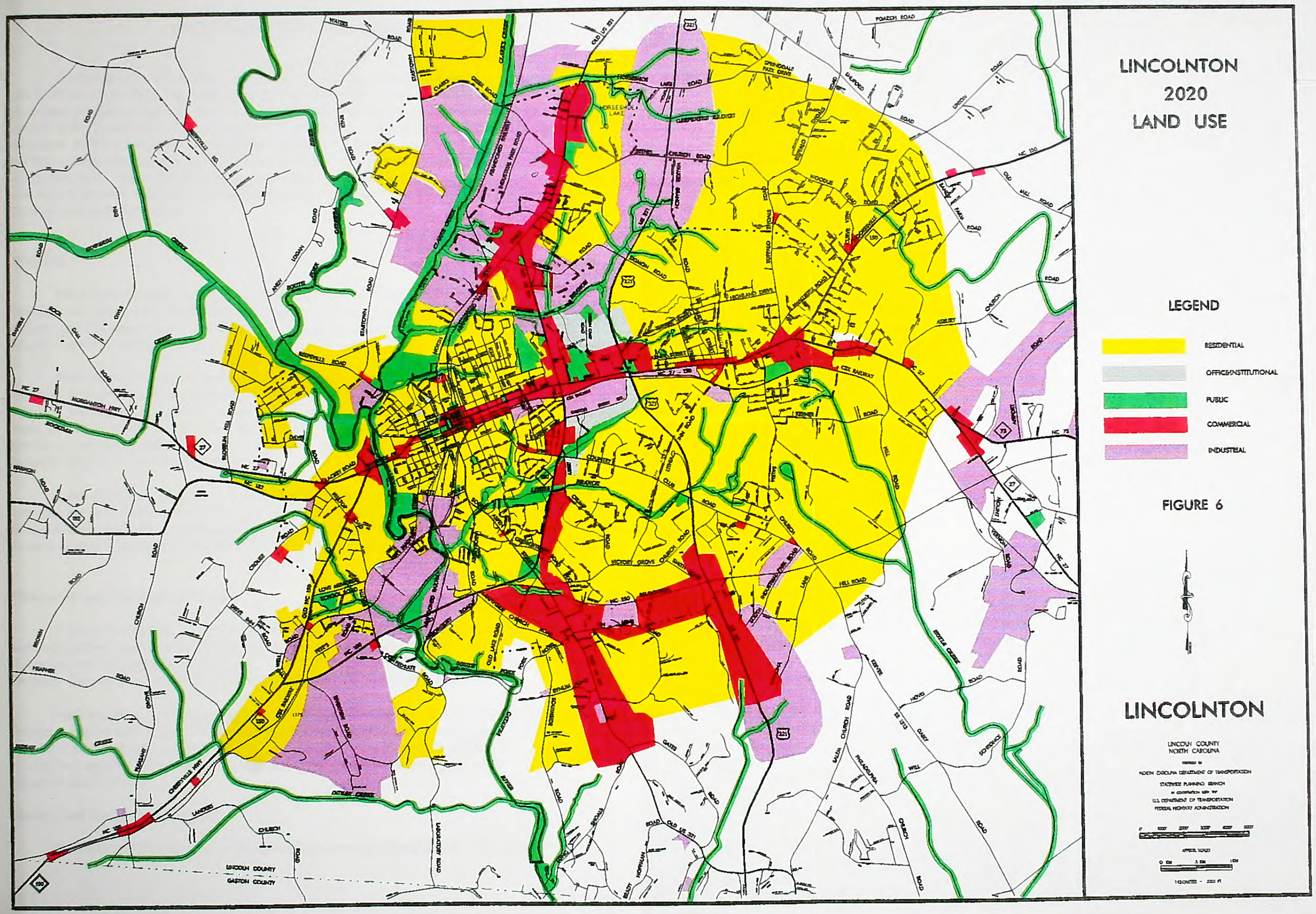
0 1000' 2000' 3000' 4000' 5000'

APPROX. SCALE

0 1M 1 IN

1 INCH = 5000 FT


LINCOLNTON
2020
LAND USE
LEGEND
RESIDENTIAL
OFFICE/INSTITUTIONAL
PUBLIC
COMMERCIAL
INDUSTRIAL
FIGURE 6
LINCOLNTON
LINCOLN COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
LINCOLN COUNTY
GASTON COUNTY

IV. ENVIRONMENTAL CONCERNS

Environmental considerations associated with highway construction are very much in the forefront of the transportation planning process today. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act of 1969. Section 102 of this act requires the execution of an environmental impact statement (EIS) for road projects that have a significant impact on the environment. Included in an EIS would be the project's impact on wetlands, water quality, historic properties, wildlife, and public lands. While this thoroughfare plan study report does not cover environmental concerns in as much detail as would an EIS, preliminary research was done on several of these factors and is included below.

Wetlands

The Corps of Engineers defines the term "wetlands" as those land areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wetlands are a crucial ecosystem in our natural environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing flood waters. They help maintain the quality of our water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one third of the plant and animal species that are federally listed as threatened or endangered.

A survey by the staff biologist for the North Carolina Department of Transportation indicated that no jurisdictional wetlands meeting the above Corps of Engineers definition would be significantly impacted by the Recommended Thoroughfare Plan. See Figure 7 for the location of jurisdictional wetlands within the City of Lincolnton planning area.

Threatened and Endangered Species

A preliminary review of the Federal Listing of Threatened and Endangered Species within Lincolnton was done to determine the effects that new corridors could have on wildlife. No species were identified in the study area. This review was conducted using mapping from the North Carolina Department of Environment, Health and Natural Resources.

The Threatened and Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered plants, animals and critical wildlife habitats. By locating rare species in the planning stage of road construction, we are able to avoid or minimize these impacts.

Historic and Archaeological Sites

The location of historic sites in Lincolnton was investigated to determine the possible

impacts of the various projects studied. The federal government has issued guidelines requiring all State Transportation Departments to make special efforts to preserve historic sites. In addition, the State of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described as follows:

National Historic Preservation Act - Section 106 of this act requires the Department of Transportation (DOT) to identify historic properties listed in the National Register of Historic Places as well as those properties eligible to be listed. The DOT must consider the impact of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) - This statute requires the DOT to identify historic properties listed on the National Register of Historic Places, but not necessarily those properties eligible to be listed. Although the DOT must consider impacts and consult with the North Carolina Historical Commission, it is not bound by recommendations made by the Commission.

There are 12 properties in the City of Lincolnton planning area which are currently listed on the National Register of Historic Places (See Figure 8). None of these properties will be affected by the projects proposed on the Thoroughfare Plan. However, care should be taken to make certain that all historic sites and natural settings are preserved. Therefore, a closer study should be done in regard to local historic sites prior to actual construction of any proposed project.

Lincolnton Wetlands

Natl. Hwy. Sys. (Primary Roads)
Blue Ridge Parkway (Federal)
Interstate
US
NC
SR
City
Other
Proposed
Roads (DOT 24k - no attributes)
Railroad
Interstate
US
NC
SR
City
Other
Pipe,Transmission & Airports (10
Airports / Substations
Airport
Power Substation
NWI (arc-24k)
NWI (poly-24k)
Hydro - Rivers/Streams (100k)
Hydro -Water Bodies (100k)
Hydro - Major Rivers/Streams (10
Hydro - Major Water Bodies (100
Municipal Boundaries (24k)

N
W
E
S

1 0 1 2 Miles

FIGURE 7

Lincolnton Historic Sites

Hist. Struct.-NR (Restricted-100k
Hist. Dist. -NR (Restricted-100k)
Natl. Hwy. Sys. (Primary Roads)
Blue Ridge Parkway (Federal)
Interstate
US
NC
SR
City
Other
Proposed
Roads (DOT 24k - no attributes)
Railroad
Interstate
US
NC
SR
City
Other
Pipe,Transmission & Airports (1
Airports / Substations
Airport
Power Substation
NWI (arc-24k)
NWI (poly-24k)
Hydro - Rivers/Streams (100k)
Hydro -Water Bodies (100k)
Hydro - Major Rivers/Streams (1
Hydro - Major Water Bodies (10
Municipal Boundaries (24k)

N
W
E
S

2 0 2 4 Miles

FIGURE 8

V. TRAFFIC MODEL DEVELOPMENT

In order to develop an efficient thoroughfare plan for Lincolnton, it was necessary to develop and calibrate a traffic network model of the City (See Figure 9). To develop the traffic model the following information was required: traffic counts, socioeconomic data, trip generation characteristics of the study area, a traffic model calibrated to duplicate Base Year 1992 travel patterns within the study area, and projected socioeconomic data for Future Year 2020. Using the projected socioeconomic data, the calibrated model was used to evaluate various street system problems and to develop alternative solutions to those problems.

The Study Area

The study area for Lincolnton consists of the City proper, the ETJ (extra-territorial planning jurisdiction) and some additional outlying area (See Figure 4). This is the area that is expected to be of urban density in year 2020. This study area was divided into 61 geographical traffic analysis zones to expedite data collection and aggregation, traffic network structure, and planning analysis. Throughout the planning area, these zones were defined on the basis of land use homogeneity.

The Base Year Network

The purpose of the traffic model is to replicate travel conditions on the city street system. Therefore, it is necessary to represent the existing street system in the model. There is a balance between having too many streets on the model to allow it to be calibrated and not having enough streets to realistically duplicate existing conditions. Generally, all the major and minor arterials and some of the major land access or collector streets need to be represented.

Street capacity is a very important component of the travel demand model. The volume/capacity ratio (v/c) gives us our best indication of present and future traffic congestion along various streets and highways.

Speed and distance are the major factors that define the minimum travel time paths from zone to zone. The model uses specific roadway minimum travel time paths and the corresponding roadway volume/capacity ratios as the bases for assigning traffic to the model network of streets.

Data Requirements

In order to produce an adequate traffic model of the study area, two additional types of data are required. First, traffic counts on routes used in the model provide a basis for calibrating the model. These traffic counts show a snapshot of traffic conditions in the study area. Second, socioeconomic data (classified housing counts and a classified employment survey) are necessary in order to generate traffic for the model. The housing and employment data for the model are shown in Appendix A.

Traffic Counts - The model must be calibrated against existing conditions in the study area. In order to calibrate the model traffic counts must be taken at various locations around the study area (See Figure 10). The counts for the Lincolnton study were collected during 1992. Also, volumes on all routes crossing the planning area boundary were counted. These counts show how much traffic is entering and exiting the study area.

Socioeconomic Data - The required data consists of a housing count and an employment survey. The housing counts are used in the model as the generator of trips and employment is used as the attractor of trips.

The best indicator of the average number of trips made from a household in a day is the household income. Since there is no adequate method for determining household income, the type and quality of housing was used as an indicator of household income. Technical staff from the Statewide Planning Branch of North Department of Transportation conducted a windshield survey to collect housing and employment data. The housing inventory was divided into five categories: excellent, above average, average, below average, and poor. Each of these categories was assigned a slightly different trip generation rate. Appendix A shows the housing counts for each traffic zone.

The employment data was collected, assigned a Standard Industrial Code (SIC) classification and grouped into five categories: Industrial, Retail, Highway Retail, Office and Service. This data was used with a regression equation developed from an origin and destination survey of a similar size city to produce an attraction factor for each zone. Appendix A shows total employment by traffic analysis zone.

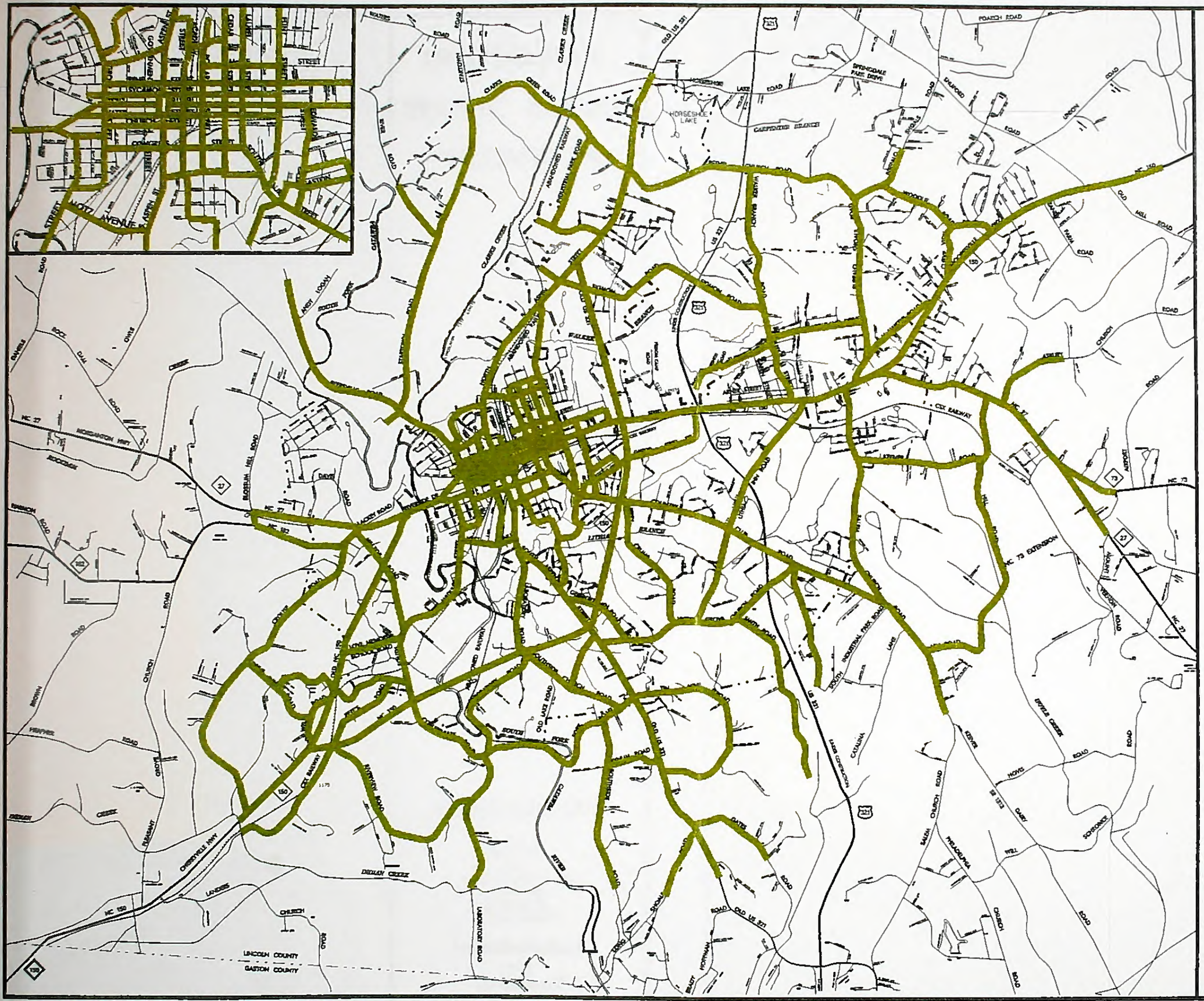
Commercial Vehicles

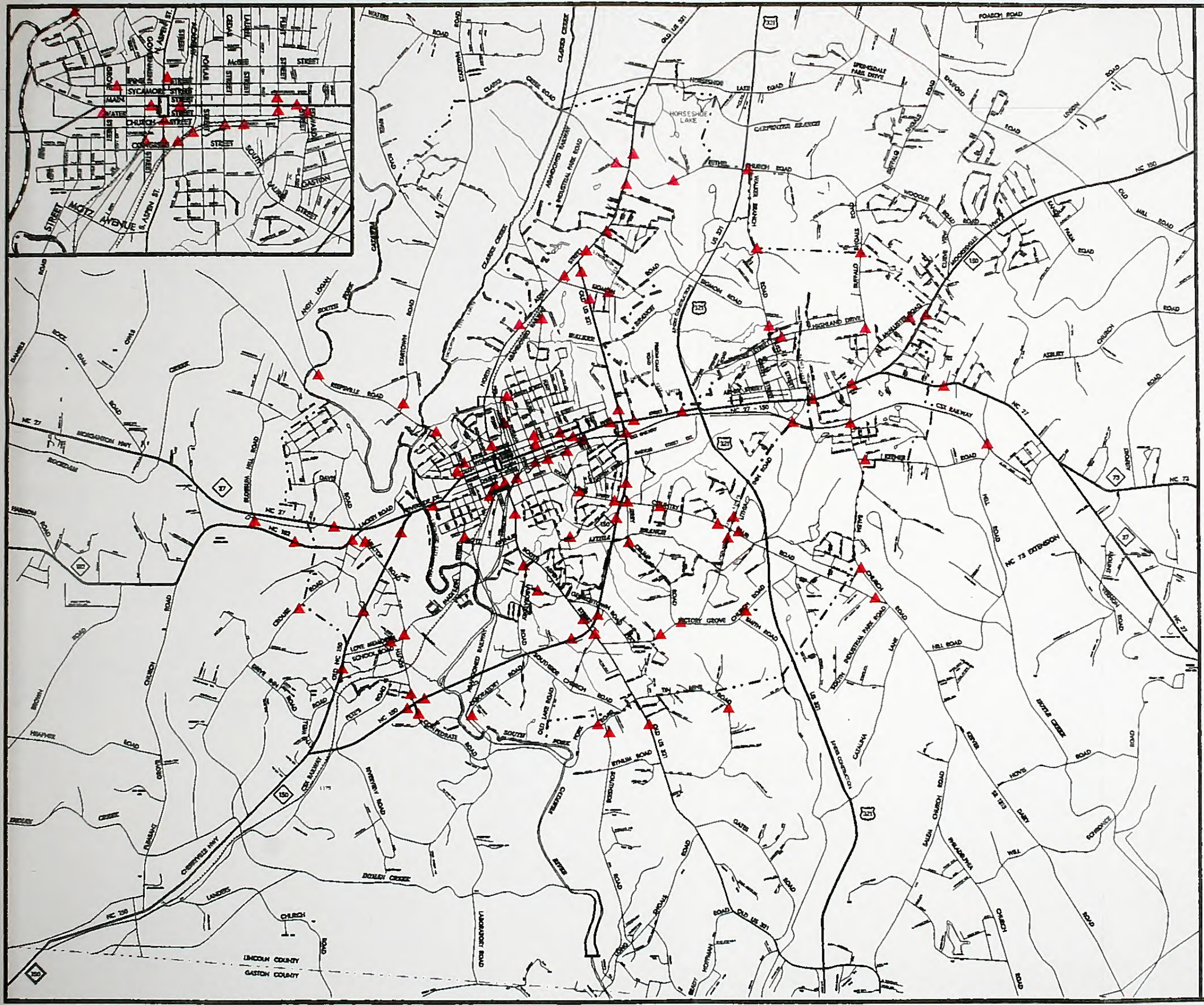
Commercial vehicles have somewhat different trip generation characteristics than do privately owned vehicles. An inventory of commercial vehicles was done at the same time as the employment and housing inventory for the study area.

Trip Generation

Trip generation is the process by which external station traffic volumes, housing data, and employment data are used to generate traffic volumes that duplicate the traffic volumes on the street network. The technical definition of a trip is slightly different than the definition of a trip used by the general public. Technically, a trip only has one origin and one destination while in actuality travelers often group, or chain, several short trips together as one longer trip.

Traffic inside the study area consists of three major components: through trips, internal-external trips, and internal trips. Through trips are produced outside the planning area and pass through enroute to a destination outside the planning area. Internal-external trips have one end of the trip outside the planning area and the other end inside the planning area. Internal trips have both their origin and destination inside the planning area. For clarity, internal trips are further subdivided into trip purposes. The trip purposes for Lincolnton are home-based work (HBW), other-home based (OHB), and non-home based (NHB).


TRANSPORTATION NETWORK ON EXISTING STREET SYSTEM
NETWORK
FIGURE 9
LINCOLNTON
LINCOLN COUNTY
NORTH CAROLINA
LINCOLN COUNTY
GASTON COUNTY



LINCOLNTON TRAFFIC COUNT LOCATIONS

LEGEND

▲ 24 HOUR COUNT LOCATION

FIGURE 10

LINCOLNTON

LINCOLN COUNTY
NORTH CAROLINA

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Through Trips - The Through Trip Table for this study was developed based on an external origin and destination survey performed in 1992 by the Traffic Surveys Unit of the Statewide Planning Branch.

External - internal (EXT) trip volume was determined by subtracting the through trip volume at each station from the total traffic volume at that station. See Table 3 for external-internal and through trip volumes.

Internal Data Summary - (IDS) is the process that takes the external-internal traffic volumes, housing data, employment data, household trip generation rates, and regression equations and generates the trip productions and trip attractions required by the gravity model. Housing units were stratified to account for differing trip generation rates for each classification. The individual trip generation rates give an average trip generation rate for the study area of 6.43 trips per dwelling unit (DU). This is slightly less than the state average of 7 to 8 trips per dwelling unit (See Table 4).

Trip attractions were produced using regression equations. The regression equations consider trip attractions to be related to the employment characteristics of the traffic zones. The regression equations for Lincolnton are:

$$\text{HBW} \quad Y = 1.00X_1 + 1.00X_2 + 1.00X_3 + 1.00X_4 + 1.00X_5 + 0.00X_{10}$$
$$\text{OHB} \quad Y = 1.00X_1 + 1.83X_2 + 8.36X_3 + 2.60X_4 + 2.55X_5 + 0.50X_{10}$$
$$\text{NHB} \quad Y = 1.00X_1 + 1.83X_2 + 8.36X_3 + 2.60X_4 + 2.55X_5 + 0.50X_{10}$$
$$\text{EXT} \quad Y = 1.31X_1 + 5.84X_2 + 2.39X_3 + 13.38X_4 + 3.76X_5 + 2.54X_{10}$$

WHERE: Y = Attraction factor for each zone
X1 = Industrial (SIC codes 1-49)
X2 = Retail (SIC codes 50-54, 56, 57, 59)
X3 = Highway Retail (SIC codes 55, 58)
X4 = Office (SIC codes 60-67, 91-97)
X5 = Service (SIC codes 70-76, 78-89, 99)
X10 = Attraction caused by housing (N/A)

The outputs of the IDS program are trip productions and trip attractions for each zone divided into four trip purposes: home-based work, other-home based, non-home based and external- internal. The trips are segregated into trip purposes because different trip lengths are associated with each trip purpose (See Table 5).

Table 3

Cordon Station Travel

	BASE YEAR 1992			FUTURE YEAR 2020		
CORDON STATION	Total ADT	Thru Trip Ends	Ext-Int Trips	Total ADT	Thru Trip Ends	Ext-Int Trips
67	6,398	1,821	4,577	13,700	5,000	8,700
68	3,142	1,015	2,127	6,273	2,225	4,000
69	245	104	141	500	200	300
70	3,325	890	2,435	7,600	3,000	4,600
71	4,143	748	3,395	8,500	2,000	6,500
72	10,106	5,016	5,090	18,700	9,000	9,700
* 73	N/A	N/A	N/A	N/A	N/A	N/A
74	5,076	810	4,266	10,100	2,000	8,100
75	6,673	2,177	4,496	13,600	5,000	8,500
76	1,355	388	967	4,000	2,200	1,800
** 77	6,191	1,181	5,010	27,700	18,200	9,500
* 78	N/A	N/A	N/A	N/A	N/A	N/A
** 79	8,654	3,024	5,630	31,300	20,600	10,700
80	6,632	1,257	5,375	12,700	2,500	10,200
* 81	N/A	N/A	N/A	N/A	N/A	N/A
82	275	50	225	800	400	400
** 83	8,625	4,759	3,866	35,000	20,000	153000
84	1,567	350	1,217	3,000	700	2,3100
85	783	82	701	1,300	100	1,300
86	963	87	876	3,500	1,800	1,700
87	554	509	45	1,000	900	100
88	9,946	2,949	6,997	20,300	7,000	13,300
89	2,143	463	1,680	7,000	3,800	3,200

* modeled by diverting traffic from other stations
** includes growth generated by new US 321

TABLE 4

Travel Model Input Variables

TRIP PERCENTAGES BY PURPOSE	YEAR	PERSONS/DU	PERSONS/VEH
Internal of Total 75%			
HBW 24%	1992	2.43	1.2
OHB 53%	2010	2.37	1.1
NHB 23%	2020	2.34	1.0

$$\text{COMPOSITE FACTOR} = \frac{\text{1992 PERSONS/VEH}}{\text{2020 PERSONS/VEH}} \times \text{USAGE FACTOR} \times \frac{\text{2020 PERSONS/DU}}{\text{1992 PERSONS/DU}}$$

$$\text{INCREASE FOR DESIGN YEAR GENERATION RATES} = \text{AVERAGE 1992 TRIP RATE} \times \text{COMPOSITE FACTOR} - \text{AVERAGE 1992 TRIP RATE}$$

$$\text{COMPOSITE FACTOR} = \frac{1.20}{1.00} \times 0.905 \times \frac{2.34}{2.43} = 1.046$$

INCREASE FOR 2020 GENERATION RATES = (6.15 X 1.046)-6.15=0.28
(Use 0.28)

Secondary NHB Trip Development:

Secondary = (Total Ext-Int Trips - Ext-Int Trips Garaged Inside Planning Area) X 0.55* NHB Trips

1992 Secondary Trips = (59,116 - 10,605) x 0.55 = 26,681

2020 Secondary Trips = (120,000 - 21,527) x 0.55 = 54,160

The breakdown of internal trips by purpose and total of non-home based trips generated externally are shown in Table 11.

* Assumed NHB trip making rate per each one-way external- internal trip by vehicles garaged outside the planning area.

TABLE 5

Travel Data Summary		
TYPE	1992	2020
Average Daily Trips per DU	6.15	6.43
Internal Trips	58,497	106,635
Home-Based Work	7,636	13,153
Other-Home Based	16,862	29,046
Non-Home Based, Internal	7,318	12,605
NHB Secondary	26,681	51,831
Internal-External Trips	59,116	120,000
Through Trips	13,840	53,300
TOTAL DAILY TRIPS (Less Thru trips)	117,613	226,000

Internal Trip Distribution

Once the number of trips generated per traffic zone is determined, those trips are then distributed to other traffic zones. The preferred method of distributing internal and external-internal trips utilizes the "Gravity Model". The model states that the number of trips produced by Zone A multiplied by the number of trips attracted to Zone B is multiplied by a travel time factor. The gravity model takes the form:

$$T_{ij} = \frac{P_i \times A_j \times F_{ij}}{\text{Sum } x=1,\ n \text{ of } A_x F_{t'x}}$$

T_{ij} = The number of trips produced in zone i and attracted to zone j.
P_i = The number of trips produced in zone i.
A_j = The number of trips attracted to zone j.
F_{ij} = The travel time factor.
n = The total number of zones.
i = The origin zone number.
j = The destination zone number.
x = Any zone number.

The travel time factor or friction factor (F_{ij}) is critical to the gravity model distribution and must be derived empirically. The friction factor is dependent on the distance between the traffic zones and the time necessary to travel that distance. This factor is also dependent on the trip purpose. In order to derive this factor a gravity model calibration program is run with an initial friction factor and trip length frequency curve for each trip purpose. The initial friction factors used in the Lincolnton model were 100 for all trip purposes and time increments. Table 6 shows the actual values used for the friction factors and trip length frequency curves.

TABLE 6

Friction Factors & Travel Curve Data
Lincolnton

TIME INTERVAL	FRICTION FACTORS HBW	OHB	NHB	EXT-INT	TRAVEL CURVES % TRIPS DISTRIBUTED HBW	OHB	NHB	EXT-INT
1	54686	54728	33818	63585	8.5	7.7	13.1	3.8
2	32387	41549	27919	52341	11.5	16.8	19.7	6.5
3	19497	26236	18745	37331	16.2	21.7	23.5	9.5
4	11821	14673	10997	24164	18.9	21.3	22.8	16.6
5	7151	7740	6056	14870	18.7	15.1	10.0	17.5
6	4277	4100	3364	9112	13.2	7.7	5.3	17.7
7	2505	2323	2025	5825	10.7	5.1	3.0	17.3
8	1424	1498	1420	4068	2.2	4.6	2.5	10.9

Model Calibration

The purpose of a traffic model is to predict the traffic on a street system at some future time. However, if the base year model is not accurate, it is useless for this purpose. Therefore the base year model must duplicate the existing traffic pattern. The actual calibration of the model is an iterative process in which incremental changes are made either in the base year trip generation, trip distribution, or street network. The purpose of each change is to allow the model to more accurately reflect the real world conditions upon which it is based. Only when the base year model can adequately reflect the existing traffic pattern should it be used to predict traffic in the future.

Accuracy Checks

There are three checks made on the base year model. The first is to follow trips through all the steps involved in the model. The purpose of this check is to insure that no trips have been accidentally added to or subtracted from the model, and that no trips have been counted twice. The second check is to compare the model generated trips to actual traffic counts on the screenlines. A model is considered to accurately reflect overall travel patterns if the trips it generates are from 95% to 105% of the ground counts on the screenlines. Table 7 compares the ground counts with the model traffic volumes on the screenlines. See Figure 4 for screenline locations.

TABLE 7

Lincolnton Actual vs. Modeled Screenline Totals

Screenline	Ground Count	Model Volume	Percent
A NS	47766	50357	105%
B EW	40636	38961	96%

The final check for the base year model is to match the assigned traffic volumes on the

links in the model with the average daily traffic (ADT) from ground counts at the same location. These link volumes can be used to find particular places in the network where there are calibration problems. This is done by comparing the assigned link volumes with the ground counts and making model revisions to minimize variances between the two.

Data Projections to the Design Year

In order to use the model, base year data must be modified to reflect assumed conditions in the future design year. These projections and the previously developed regression equations were used to produce future trip productions and attractions in the same manner as for the base year.

Employment Projections - A linear projection of the employment to population ratio based on the 1992 employment survey was done to determine the future ratios. This ratio is expected to increase in the future from its current value of 0.74 to 0.91 by the year 2020. Using the future population figure and employment/population ratio, the number of jobs in the planning area was determined. Based on the Standard Industrial Code, the major job type is industrial. This trend is expected to continue in the future. Appendix A shows the base year and future year employment data.

Dwelling Unit Projections - Future dwelling units were determined by extending person per dwelling unit trends for Lincoln County linearly to the design year. The number of dwelling units are projected to increase by 1.80% per year. The distribution and projection of Future Year 2020 housing was provided by the City of Lincolnton Planning Department. Appendix A lists the dwelling units per zone for the base year and future year 2020.

External and Through Trips - For Future Year 2020, external-internal and through travel trips were projected from Base Year 1992 using linear projection of the past growth rate at each external station (See Table 3).

VI. TRAVEL DEFICIENCY ANALYSIS OF EXISTING SYSTEM

This chapter presents an analysis of the ability of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but on understanding their cause. Travel deficiencies may be localized as a result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by a system deficiency such as a need for a bypass, loop facility, construction of missing links, or additional radials.

Existing Travel Patterns

An indication of the adequacy of the existing street system is a comparison of traffic volumes versus the ability of the streets to move traffic. In an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, access control, width of pavement, and the traffic control devices (such as signals) utilized.

Capacity is the maximum number of vehicles which has a "reasonable expectation" of passing over a given section of a roadway, during a given time period under prevailing roadway and traffic conditions. The relationship of traffic volumes to the capacity of the roadway will determine the **level of service (LOS).** Six levels of service identify the range of possible conditions. Figure 11 illustrates the levels of congestion associated with the various levels of service. Table 8 gives a brief description of each LOS in accordance with the 1994 Highway Capacity Manual.

Design requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each road or highway section must be individually analyzed and its design requirements determined by the amount and type of projected traffic, existing capacity, desired level of service, and available right of way. The recommended improvements and overall design of the Thoroughfare Plan were based on achieving a minimum of LOS D on existing facilities, and LOS C on new facilities. LOS D is considered the **"practical capacity"** of an urban facility, or that at which the public begins to express dissatisfaction.

Table 8

LEVEL OF SERVICE

LOS A - Describes primarily **free flow conditions.** The motorist experiences a high level of physical and psychological comfort. Vehicles are spaced at an average of 440 ft at a maximum density of 12 passenger cars per mile per lane (pc/mi/ln). Minor disruptions to flow are easily absorbed at this level without a change in travel speed. Maneuverability within the traffic stream is good.

LOS B - also represents **reasonably free flow conditions** although the presence of other vehicles begins to be noticeable. Vehicles area spaced at an average of approximately 264 ft at a maximum density of 20 pc/mi/ln. The ability to maneuver within the traffic stream is only slightly restricted.

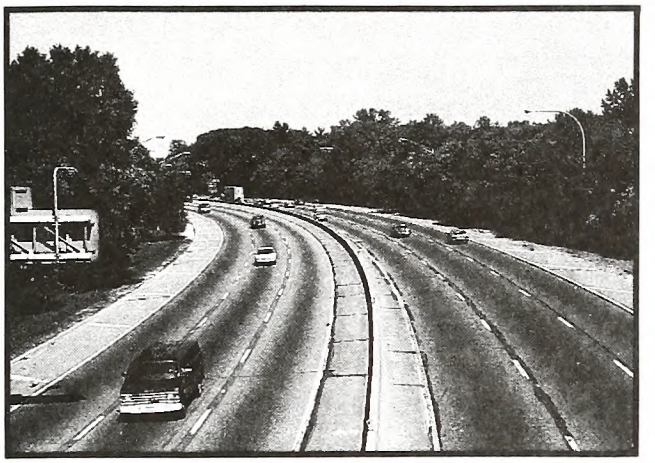
LOS C - provides for **stable operations,** but flows approach the range in which small increases will cause substantial deterioration in service. Freedom to maneuver within the traffic stream is affected by the presence of other vehicles. The average spacing of vehicles is reduced to approximately 189 ft at a maximum density of 28 pc/mi/ln. Minor incidents may still be absorbed, but the local decline in service will be great. Queues may be expected to form behind any significant blockage.

LOS D - represents a range in which **ability to maneuver is severely restricted** because of traffic congestion. Travel speed begins to be reduced by increasing volumes. The average spacing of vehicles is 155 ft at a maximum density of 34 pc/mi/ln. Freedom to maneuver is severely limited, and the driver experiences drastically reduced comfort levels. Minor incidents can be expected to create substantial queuing.

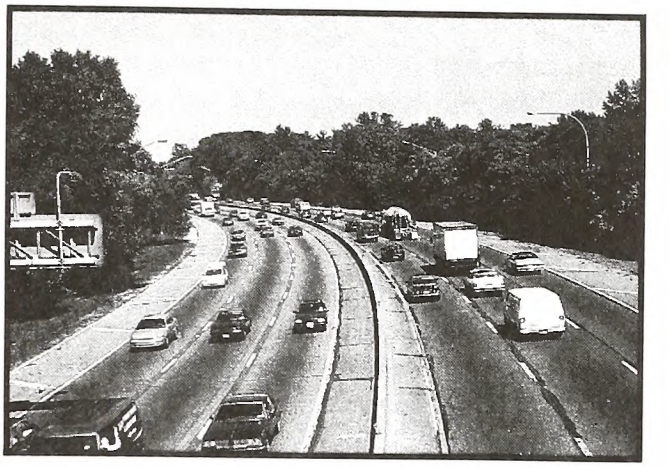
LOS E - represents **operations at or near capacity and is quite unstable.** The densities at LOS E vary depending upon the free flow speed. For the majority of multi-lane highways with free-flow speeds between 45 and 60 mph, passenger-car speeds at capacity range from 40 to 55 mph but are highly variable and unpredictable within that range. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or changing lanes, requires the following vehicles to give way to admit the vehicle. This condition establishes a disruption wave which propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce a serious breakdown with extensive queuing.

LOS F - represents **forced or breakdown flow.** It occurs either at a point where vehicles arrive at a rate greater than the rate at which they are discharged or at a point on a planned facility where forecast demand exceeds computed capacity. Although operations at such points will appear to be at capacity, queues will form behind these breakdowns. Average travel speeds with queues are generally less than 30 mph.

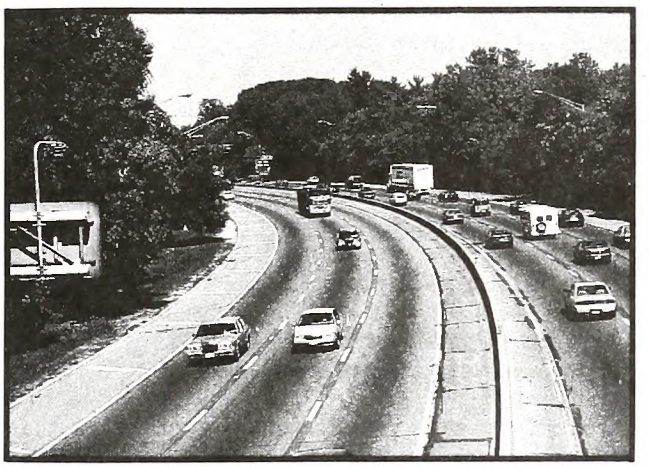
Source: 1994 Highway Capacity Manual



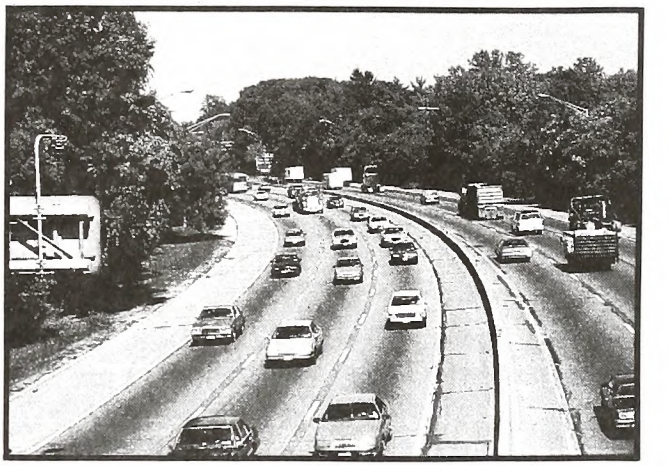
LOS A.



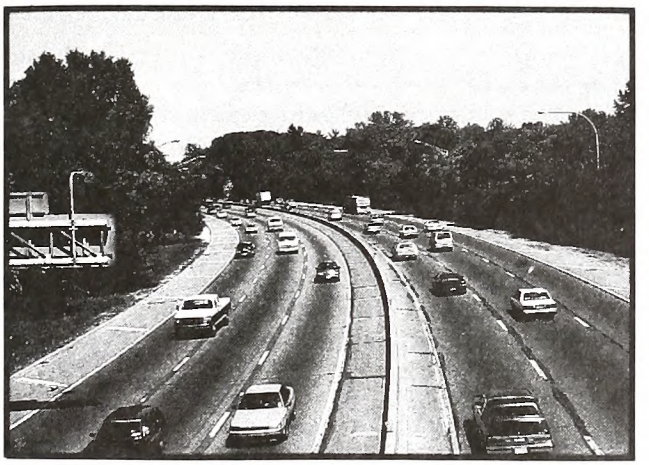
LOS D.



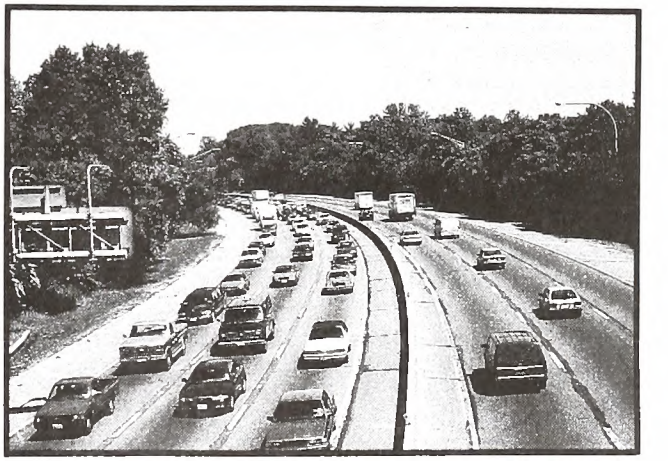
LOS B.



LOS E.



LOS C.



LOS F.

FIGURE 11

LEVELS OF SERVICE

1992 Traffic Capacity Analysis

Capacity Deficiencies - Figure 12 illustrates the Base Year 1992 City of Lincolnton street system with the Average Daily Traffic (**ADT**). A comparison of the Base Year ADT to street segment capacities reveals several major streets near or over practical capacity (LOS D). These areas are highlighted, and include:

East Main Street - From NC 155 (Old US 321) to the junction of NC 150 (Mooresville Highway) and NC 27 East is currently approaching and over capacity. The capacity of this section is 26,000 vpd (vehicles per day). Currently approximately 26,000 vpd are using this section of roadway. The US 321 Bypass was recently opened to traffic resulting in increased traffic west of US 321 and decreased traffic east of US 321. If no improvements are made on East Main Street, Future Year 2020 traffic is estimated at 34,600 vpd.

West Main Street/Riverside Drive - It is currently approaching or over capacity. The capacity of this section is 12,000 vpd (vehicles per day). Currently approximately 9100 to 13,200 vpd are using this section of roadway. If no improvements are made on **West Main Street/Riverside Drive** Future Year 2020 traffic is estimated at 14,300 vpd.

NC 155 (Old US 321) - From South Aspen Street at Victory Church Road to Bethel Church Road, NC 155 is a two lane facility with a capacity 12,000 vpd. It is currently carrying 15,400 vpd. By the design year this volume is projected to be 14,700 vpd. A significant amount of through traffic has been recently diverted due to the opening of new US 321.

NC 27 - From the junction with NC 73 to approximately 0.7 km east of the junction with NC 150 (Mooresville Highway), NC 27 has a capacity of 12,000 vpd. Base Year 1992 ADT volume was 16,000 vpd. By Year 2020, volumes are expected to increase to 19,000 vpd. And NC 27/150 East between Lithia Inn Road and NC 150 (Mooresville Highway) has a capacity of 26,000. 1992 volumes were at 25,800 vpd.and they are expected to be at 31,000 vpd by 2020.

Traffic Accidents

High Accident Location - Traffic accident records are of assistance in defining problem areas and often pinpoint a deficiency such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from analysis of accident data can lead to remedial action reducing the number of accidents.

Both the severity and number of accidents should be considered when investigating accident data. The severity of every accident is measured with a series of weighting factors developed by NCDOT's Division of Highways. In terms of these factors, a fatal or

incapacitating accident is 47.7 times more severe than one involving only property damage, and an accident resulting in minor injury is 11.8 times more severe than one with only property damage. Table 9 is a summary of accidents in Lincoln County from January 1, 1989 through December 31, 1994.

The "Total" column indicates the total number of accidents reported within two hundred (200) feet of the intersection during the indicated time period. The severity listed is the average accident severity for that location.

Table 9

Accident Summary 01/01/89 to 12/31/94

LOCATION	TOTAL	SEVERITY
1. Old US 321/NC 155 @ Aspen	15	3.96
2. Old US 321/NC 155 @ Country Club	14	9.06
3. Old US 321/NC 155 @ Timken	17	7.20
4. Old US 321/NC 155 @ Laurel	12	16.10
5. Old US 321/NC 155 @ Main	83	5.88
6. Old US 321/NC 155 @ Sigmon	37	6.70
7. Old US 321/NC 155 @ Water	11	9.91
8. Old US 321/NC 155 @ Gaston	21	6.02
9. Abernathy @ Main	26	5.62
10. Aspen @ Flint	12	1.62
11. Aspen @ Sigmon	16	8.51
12. Cedar @ Main	11	2.35
13. Country Club @ Lithia Inn	11	10.58
14. Court Square @ Main	13	1.57
15. Edward @ Main	14	5.23
16. Flint @ Main	27	8.53
17. Grove @ Main	27	8.53
18. Hollybrook @ Main	27	6.27
19. Huss @ Main	22	16.46
20. Laurel @ Main	21	5.67
21. Laurel @ Water	12	9.17
22. Lithia Inn @ Main	10	10.06
23. Main @ Newbold	59	9.02
24. Main @ Poplar	11	3.02
25. Main @ Prison Camp	16	7.13
26. Main @ Gaston	10	17.64

BASE YEAR 1992 SYSTEM DEFICIENCIES

ADT Compared with Capacity of 1992 Existing Street System

LEGEND

ADT/CAP 0.85 – 1.00

ADT/CAP >1.00

TRAFFIC / CAPACITY ⇒ 00,000 / 00,000

FIGURE 12

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3400 / 11,000
13,600 / 14,000
4600 / 13,000
4400 / 11,500
8500 / 11,000
9100 / 14,000
6800 / 12,000
9300 / 12,000
9100 / 12,000
6200 / 12,500
2100 / 12,500
5000 / 11,000
13,200 / 12,000
9800 / 13,000
7800 / 12,500
3000 / 10,500
1300 / 9500
4300 / 12,000
6400 / 12,000
15,300 / 20,000
5600 / 12,000
15,400 / 14,000
26,600 / 26,000
2,600 / 12,000
N/A / N/A
10,900 / 12,000
6,800 / 20,000
10,500 / 12,500
10,100 / 13,000
1,800 / 10,500
3700 / 11,500
5200 / 11,500
6200 / 11,500
7700 / 12,500
16,000 / 12,500
25,800 / 26,000
4600 / 12,500
4200 / 12,500
N/A / N/A
6100 / 12,500
8300 / 13,000
5900 / 13,000

VII. EVALUATION OF ALTERNATIVE PLANS

The process of developing, testing, and evaluating alternative plans involved a number of considerations. These considerations included area goals and objectives, identified capacity and system deficiencies, environmental and social impacts, and anticipated land development. Travel forecasts provide a basis for evaluation of alternatives as to ability to serve future travel desires. Aerial photography, field reconnaissance, environmental resource agencies provide a basis for evaluation of alternatives in regards to environmental issues. Aerial photography, field reconnaissance, cooperation with the city staff, and input from citizens provided other bases for plan evaluation.

Do Nothing Alternative

Not implementing a thoroughfare plan or elements of it could be called a "do nothing" alternative. This means that there would be no new construction or roadway improvements to the Lincolnton thoroughfare system except for routine maintenance. If no improvements are made during the planning period there will be increased traffic volumes along the US 321 Bypass, NC 155, NC 150, NC 27 and NC 73. This results in a reduction of LOS on these major thoroughfares. Figure 13 shows the existing system assuming that no improvements are made by Future Year 2020.

Non-construction Alternatives

In addition to the "do nothing" alternative, it is desirable to take a more in depth look at the existing street system to determine if non-construction options can enable the existing system to serve future travel. The following is a discussion of non-construction options:

1. **Control of Access** maintains the capacity of a road by not allowing strip commercial development to create large volumes of turning traffic at many closely spaced locations. Route where some control of access should be considered are NC 150, NC 27, NC 155 (Old US 321), and Cherryville Highway.

2. Existing street capacities can be improved by **removing on-street parking**. Prior to removal of on-street parking, the excess or deficiency of parking in the immediate area must be considered.

3. The implementation of **one-way streets** can increase the capacities of the facilities by up to 50 percent. One-way pairs have the additional benefit of increasing the safety of the facilities involved.

Prior to a **traffic signal** being installed, the through movement on the facility is permitted continuously. Upon signal installation, the time permitted for the through movement on the primary facility is significantly reduced to allow for conflicting movements, possibly as much as 50 percent. This results in a reduced capacity for the primary facility. Therefore, it is

important that signals be installed judiciously, and with consideration to the overall impact on the transportation system.

5. An aggressive **carpool, vanpool**, or **public transit** program should process the same number of person-trips while decreasing the number of vehicle-trips and thus would decrease congestion.

6. **Bicycling** is increasing in popularity as a mode of travel. In fact, the Board of Transportation states in its 1991 policy on bicycles, "...the Board of Transportation finds that bicycling is a bonafide highway purpose subject to the same rights and responsibilities and eligible for the same considerations as other highway purposes...". The North Carolina Department of Transportation's Bicycle Coordinator is available to assist communities with bicycle route planning.

7. **Altering work hours (or flex-time)** such that the beginning and ending times are staggered can reduce travel in the peak hour. The resulting peak period would be less congested, but last longer. Therefore, the total traffic carrying ability of an existing street can be increased with no capital outlay for street improvements.

8. **Restrictions on growth** would also slow traffic growth and delay the need for street improvements. This approach, however, would adversely affect the economy of the planning area. A much better approach is to coordinate growth with a progressive system of transportation improvements that anticipate increases in travel desires.

These non-construction alternatives will improve operations on the existing system, but they alone cannot accommodate the long term traffic growth in the area. The "do nothing" alternative is not viable in transportation planning for the Lincolnton area because of the overwhelming disadvantages.

Construction Alternate "A"

One plan considered, was to build no new facilities beyond those on the committed system and only widen existing facilities. Figure 14 shows this plan. Many facilities would have to be widened extensively to handle future traffic demands. Even after the widening many of the facilities would be operating at capacity.

NC 27/Riverside Drive/Main Street would need to be widened in some places to 7 lanes.
NC 155 (Old US 321) north of Main Street would need to be widened to 5 lanes
Cherryville Highway would need to be widened to 4 lanes.
NC 150 would need to be widened to 4 lanes.
North Aspen Street would need to be widened to 4 and 5 lanes.
Bethel Church Road would need to be widened to 5 lanes.
Startown Road would need to be widened to 4 lanes
Reepsville Road would need to be widened to 4 and 5 lanes.
Grove Street would need to be widened to 4 and 5 lanes.
Congress Street would need to be widened to 4 lanes.
Hilltop Road would need to be widened to 4 and 5 lanes.

LINCOLNTON

FUTURE YEAR 2020 SYSTEM DEFICIENCIES

ADT Compared with Capacity of 1992 Existing and Committed Street System

LEGEND

ADT/CAP 0.85 - 1.00

ADT/CAP >1.00

TRAFFIC / CAPACITY => 00,000 / 00,000

FIGURE 13

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0 1000 2000 3000 4000 5000

0 1/2 1 1/2

1 KILOMETER = 3280 FT

4900 / 11,000
23,200 / 14,000
43,900 / 54,000
9800 / 11,500
9200 / 11,500
6400 / 12,000
6800 / 10,500
14,900 / 11,500
13,100 / 40,000
19,200 / 10,500
12,900 / 13,000
11,000 / 11,500
22,900 / 11,000
23,900 / 14,000
14,700 / 14,000
13,200 / 12,000
34,600 / 26,000
8,700 / 12,000
27,500 / 12,000
14,300 / 12,000
22,600 / 20,000
54,500 / 54,000
6800 / 13,000
47,700 / 26,000
23,000 / 12,500
5200 / 12,000
15,300 / 12,500
10,100 / 13,000
11,400 / 12,500
39,900 / 12,000
8,200 / 12,000
10,400 / 20,000
15,500 / 11,000
8100 / 12,000
9100 / 12,500
43,500 / 13,000
1400 / 9800
3200 / 10,500
14,300 / 12,500
34,100 / 40,000
33,400 / 40,000
20,200 / 12,500
48,400 / 54,000
16,100 / 13,000

NC 182 would need to be widened to 4 lanes.
Georgetown Road Extension would need to be 5 lanes.
Country Club Road between Old US 321 and Lithia Inn Road would need to be 4 to 5 lanes.
US 321 would need to be 6 lanes.
Salem Church Road would need to be 4 lanes.
Buffalo Shoals Road would need to be widened to 4 and 5 lanes.
Bethel Church Road between Buffalo Shoals Road and NC 155 would need to be 5 lanes.
Bonview Avenue would need to be 4 lanes.

Extensive widening can be extremely disruptive to existing structures. It also does not help serve the transportation needs in growing areas.

Construction Alternate "B"

Alternate B is shown in Figure 15. There are several new facilities proposed in this alternative. Startown Road is recommended to be extended to Riverside Drive where it meets the extension of Motz Avenue, thus forming an inner loop system to the west of the CBD (Central Business District). Sigmon Road is also extended to Startown Road to the west and to NC 150 to the east. This facility serves as a needed east-west route in the northern planning area. A new facility is proposed from Bethel Church Road to Old US 321 offering local traffic an alternative route to congested US 321. Highland Drive is proposed to extend to Pine Street. And it is recommended to extend Sycamore Street to Riverside Drive. This alternate offers little relief to the congested CBD area or congested east-west and north-south routes through Lincolnton. Much of Lincolnton's growth is occurring outside of the city limits. In this alternative there are no recommendations that would serve the growing needs in these areas of growth.

Construction Alternate "C"

There were several proposed facilities tested and studied in Alternate "B" that seemed to have a very positive effect on traffic demands on existing streets. These proposed facilities were retained in Alternate "C" (shown in figure 16):

Extension of Startown Road to Riverside Drive
Extension of Motz Avenue to Riverside Drive
Extensions of Sigmon road to the east and west
Extension of Sycamore Street to Riverside Drive

Then a loop system was added to the east and north to correct a system deficiency which presently forces traffic to come into the downtown business district via Main Street and Grove Street in order to cross the urban area to perimeter destinations outside downtown. It is anticipated that industrial and commercial development will continue to occur in the north and northwest quadrants of the planning area while residential growth especially continues to the east and south. This alternative best met the traffic demands of the Lincolnton Planning Area and became the basis of the thoroughfare plan.

LINCOLNTON URBAN AREA THOROUGHFARE PLAN ALTERNATIVE FACILITY PLAN "A"

LEGEND

IMPROVEMENT	EXISTING LOCATION	NEW LOCATION
7 LANES		
6 LANES		
5 LANES		
4 LANES		
2 LANES		

FIGURE 14

LINCOLNTON

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0 1000 2000 3000 4000 5000

APPROX. SCALE

0 .5 KM 1 KM

1 KILOMETER = 3280 FT

LINCOLNTON URBAN AREA THOROUGHFARE PLAN ALTERNATIVE FACILITY PLAN "B"

LEGEND

IMPROVEMENT	EXISTING LOCATION	NEW LOCATION
7 LANES		
6 LANES		
5 LANES		
4 LANES		
2 LANES		

FIGURE 15

LINCOLNTON

LINCOLN COUNTY
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0 1000 2000 3000 4000 5000

ARTERIAL SCALE

0 1/4 3/4 1 IN

LINCOLNTON URBAN AREA THOROUGHFARE PLAN ALTERNATIVE FACILITY PLAN "C"

LEGEND

IMPROVEMENT	EXISTING LOCATION	NEW LOCATION
7 LANES		
6 LANES		
5 LANES		
4 LANES		
2 LANES		

FIGURE 16

LINCOLNTON

LINCOLN COUNTY
NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

VIII. RECOMMENDED THOROUGHFARE PLAN

A thoroughfare plan study reveals the need for new facilities, plus identifies existing and future deficiencies in the transportation system. The thoroughfare plan is a representation of the existing highway system by functional use, e.g., major thoroughfares, minor thoroughfares plus any new facilities which are needed. The planning methodology enables identification of deficiencies in the existing system, allowing compilation of a list of needed improvements.

This chapter presents an analysis and makes recommendations based on the ability of the existing street system to serve the present and future travel desires as the area continues to grow. The usefulness of transportation planning is in the analysis of different highway configurations for their efficiency in serving the area. The Recommended Lincolnton Thoroughfare Plan (See Figure 2) sets forth a system of thoroughfares to serve the anticipated traffic and land development needs for the Lincolnton area. The need to eliminate existing and projected system deficiencies which cause traffic congestion is the primary objective of the plan.

This plan is a revised version of the April, 1982 Thoroughfare Plan. The recommended revisions are based on the results of a traffic forecast model that uses data on traffic counts, population, housing, employment, and vehicle ownership to simulate travel (See Chapter V). With this model each major street and highway in the planning area is analyzed to determine its ability to serve existing and future traffic demands. In the development of the updated thoroughfare plan, some proposals from the previous thoroughfare plan have been retained, some were found inadequate for current traffic problems and were dropped, and some new proposals were added. These changes and additions include:

Major Thoroughfares

1. Retain the widening of NC 27 (Charlotte Highway) from two lanes to four lanes between SR 1481 and SR 1317 (Mt. Vernon Church Road). Widen NC 27 to five lanes from US 321 to NC 150.

2. Retain the widening of Cherryville Highway (SR 1407) from two lanes to four lanes between NC 150 and Hilltop Road (SR 1225), with widening from two lanes to five lanes between Hilltop Road and NC 27 West. Also, extend Cherryville Highway as a four-lane facility on new location from NC 27 West northward to Startown Road (SR 1005).

3. Retain the extension of Motz Avenue from S. Aspen Street to Laurel Street.

Minor Thoroughfares

1. Retain the extension of Sycamore Street from Flint Street to East Main Street.

2. Retain the extension of Sycamore Street from Grove Street to Riverside.

3. Retain the widening of Water Street from Flint Street to East Main Street.

Updated Thoroughfare Plan Recommendations (Purpose and Need)

The process of developing, testing and evaluating alternate plans involved a number of considerations as discussed in the previous chapter. The alternatives that best met the current and expected future traffic demands were then studied further and became a part of the updated thoroughfare plan. Aerial photography, topographic mapping, field reconnaissance and discussion with local staff, officials and interested local citizens provided additional basis for identifying and evaluating alternate alignments. The following describes the plan in terms of its functional parts.

Bypass Facility

1. US 321 - US 321 is a major facility used by local and through traffic. It and NC 155 are the primary north-south routes. It will facilitate travel between Lincolnton, Gastonia and Charlotte. Volumes from 36,000 VPD to 46,000 VPD are expected by the Future Year 2020. Congestion is already occurring on the existing facility. With these high volumes it is recommended this facility be widened to six lanes with a 46 foot median (Cross-Section L, Appendix D).

2. Old US 321 (NC 155) - Volumes from 10,000 VPD to 18,000 VPD are expected by Design Year 2020. It will carry local commercial traffic and other local travel from the southeast. With these high volumes it is recommended that this facility be widened to five lanes (Cross-Section C, Appendix D) to offer relief. There is a good deal of commercial development exiisting (and more expected) along this facility. A turn lane is needed due to the large amount of turns occurring.

3. NC 150 - NC 150 carries significant volumes. It is a major route that runs southwest-northeast. It serves both local and through traffic. It is a significant east-west route for the entire region and is the most direct route from Lincolnton to I-77. There are no alternative routes for much of the traffic using this facility. Congestion will only continue to worsen without widening. Volumes from 17,000 VPD to 23,000 VPD are expected by the design year. With these high volumes it is recommended this facility be widened to four lanes with a 46 foot median (Cross-Section A, Appendix D) from NC 27 East to the eastern planning area boundary and from Cherryville Highway to Laboratory Road (SR 1238). Ample building line setbacks should be required if industrial plants decide to locate in the area.

4. NC 150 Relocation - This new facility is recommended to be a four-lane facility (Cross-Section A, Appendix D) in the southern portion of the planning area. It will serve as part of a loop system for the entire region and will give better access to the area around Lake Norman. This road should have an interchange with the Northeast Loop, thus providing a continuous flow around the planning area. Volumes are expected to be 22,000 VPD by design year. It will offer some relief to existing NC 150. This relocation will also provide an essential east-west facility to give relief to NC 27.

5. NC 27 - NC 27 is the major east-west facility that goes through the Linconton Planning area. It connects Lincolnton to Mount Holly and also serves local traffic through town. While the NC 150 relocation, the Northwest/Northeast Loops and Sigmon Road

Extension will all help remove traffic on NC 27; volumes which are already high will continue to increase. Volumes from 15,000 VPD to 31,000 VPD are expected by the design year. With these high volumes it is recommended this facility be widened to five lanes (Cross-Section C, Appendix D) between NC 182 and the proposed Northwest Loop, four lanes between SR 1481 and SR 1317, and five lanes between US 321 and NC 150. Ample building line setbacks should be required if industrial plants decide to locate in the area.

Loop System

1. Northwest Loop - This proposed loop facilitates circumferential travel movements in the northern and western parts of the planning area where industrial expansion is expected to continue. With the growth in traffic volumes this loop would correct a system deficiency which presently forces traffic to come into the downtown business district via Main Street and Grove Street in order to cross the urban area to perimeter destinations outside downtown. Design year traffic is anticipated to be 8400 to 17,000 VPD from NC 27 West to US 321 North and 6800 VPD from NC 27 West to NC 150 South. It is recommended to build a two-lane facility initially (Cross-Section K, Appendix D) on 220' right-of-way with a four-lane cross-section ultimately (Cross Section A, Appendix D) being built.

2. Northeast Loop - This proposed loop facilitates circumferential travel movements in the northern and eastern parts of the planning area. Design year traffic is anticipated to be 2600 VPD to 16,000 VPD. To accommodate this traffic a four-lane (Cross-Section A, Appendix D) facility is recommended ultimately, with two lanes being constructed initially.

3. Motz Avenue - Motz Avenue is recommended to be extended to Riverside Drive to the west (Cross-Section K, Appendix D) and to Flint Street to the east (Cross-Section K, Appendix D). Motz Street will then operate along with Flint Street and Startown Road (with its extension) as an inner loop system around the CBD area. This loop system should provide relief to Main Street and Aspen Street. Volumes are expected to be between 2600 and 8300 VPD along Motz Street and its extensions.

Radial Streets

1. North Aspen Street - This road is a most important facility serving the planning area since it not only carries traffic to the Central Business District (CBD), but also serves north-south travel between Lincolnton and Maiden. Due to heavy traffic in the school area, turn lanes to accommodate school traffic are recommended. Much of this traffic is due to industries located north of downtown Lincolnton. Anticipated traffic by the year 2020 is 18,000 VPD. Widening of this facility from a two-lane to a four-lane facility (Cross-Section G, Appendix D) is required.

2. South Aspen Street - This road is an important facility serving the planning area since it not only carries traffic to the Central Business District (CBD), but also serves north-south travel between Lincolnton, Cherryville and Gastonia. Much of this traffic is due to employment opportunities in the Gastonia area. Anticipated traffic by the

year 2020 is 8000 VPD. No improvements are recommended at this time.

3. Buffalo Shoals Road - This road serves the needs of the residents in the northeast. The anticipated design year traffic volumes on this facility is 8000 VPD to 12,000 VPD. Widening is recommended from a two-lane facility to five lanes (Cross-Section C, Appendix D) between Highland Drive and East Main Street to handle traffic demands and to allow for heavy turning movements.

4. Cherryville Highway (NC 150/SR 1407) - This route is projected to carry traffic for the year 2020 near 12,000 VPD to 27,000 VPD from the southwestern planning area boundary to NC 27/Riverside Drive and 12,500 VPD to the downtown business district. To accommodate this traffic by the design year widening from a two-lane to a four-lane facility (Cross-Section G, Appendix D) is recommended between Crouse Road (SR 1228) and Hilltop Road (SR 1225) with a five-lane facility (Cross-Section C, Appendix D) from Hilltop Road to NC 27 West.

5. South Laurel Street (SR 1262) - This road serves the needs of the residents in the southeast. The anticipated design year traffic volumes on this facility is 2600 VPD to 10,000 VPD. No improvements are recommended.

6. East Main Street (NC 27) - This street provides access to town for outlying areas south of Lincolnton. With residential and industrial growth expected in the southeastern part of the planning area this road will play a major role in serving the future needs of these residents. Year 2020 traffic is expected to be 8900 to 23,000 VPD. Without relief provided by the construction of a loop system around Lincolnton, these volumes could be up to 10,000 VPD higher by the design year. It is recommended to widen this facility to five lanes (Cross-Section C, Appendix D) from Flint Street to US 321. (See NC 27 East for section to NC 150).

7. West Main Street/Riverside Drive/NC 27 West - Design year traffic is 9800 VPD to 20,000 VPD. This street provides access to town for outlying areas south of Lincolnton. With residential and industrial growth expected in the western part of the planning area this road will play an important role in serving the future needs of these residents. Improvements are recommended including a five-lane facility (Cross-Section C, Appendix D) from Grove Street to Gainesville Church Road (SR 1181) with a bridge widening across West Fork Catawba River.

8. Old US 321 (NC 155) - This route serves as a major route between Maiden and Lincolnton. With US 321 in place, through traffic is diverted off this facility, thus relieving a lot of congestion. Yet, this route continues to experience growth and will continue to become more congested. Anticipated traffic by the year 2020 will range from 10,000 VPD to 18,000 VPD in the corporate limits. Widening is recommended from the existing three lanes to five lanes (Cross-Section C, Appendix D) from south of East Main Street to Noles Circle (SR 1281).

9. NC 182 - Year 2020 traffic is expected to be 7000 VPD. Improvements are not recommended.

10. Salem Church Road - This road serves the needs of the residents in the southeast. The anticipated design year traffic volumes on this facility is 12,000 to 14,000 VPD.

Widening is recommended from two lanes to four lanes (Cross-Section G, Appendix D) between East Main street and Keener Dairy Road (SR 1313).

Crosstown Streets

1. Congress Street - This facility parallels Main Street Avenue and serves east-west movement through the CBD. Year 2020 traffic volumes are anticipated to be 7000 VPD. Improvements are not recommended.

2. Flint Street - This road serves the north central section of the planning area running north-south through the eastern side of the CBD. Year 2020 traffic can reach 6000 VPD. Improvements are not recommended.

3. Government Street - This facility runs north-south through the western side of the CBD. Year 2020 traffic volumes are anticipated to be 4800 VPD. Improvements are not recommended.

4. Grove Street (SR 1008/SR 1222) - This road serves the needs of the residents in the northwest and also runs north-south through the western side of the CBD. It is an important facility in the area as there is not a good alternative route if this road beomes heavily congested. This facility is anticipated to carry 14,000 VPD by the year 2020. Widening improvements from two lanes to five lanes (Cross-Section C, Appendix D) are recommended between Bonview Avenue and West Main Street.

5. Main Street - This facility carries the majority of the east-west traffic through the central business district of Lincolnton. Due to its direct alignment and a lack of alternate east-west and north-south thoroughfares, this route has become popular both to local residents, through traffic and trucks serving industrial plants, and is by far the most widely used facility. With the recent opening of the new bypass, there was some temporary decrease in travel along this route. Future Year 2020 traffic volumes are estimated to reach as high as 23,000 VPD; even higher if other east-west facility are not constructed. Improvements are outlined above under "Radial Streets".

6. Pine Street - This facility parallels Main Street and serves east-west movement through the CBD. Year 2020 traffic volumes are anticipated to be 8700 VPD. Improvements are not recommended.

7. Reepsville Road (SR 1008) - This facility serves the northwest section of Lincolnton. It moves traffic to and from the CBD. Volumes are expected to reach 10,000 VPD by design year. No improvements are recommended.

8. Sigmon Road (SR 1266/SR 1267) - This facility currently serves the northeastern section of the town. The current traffic on this road is approximately 1200 to 3200 VPD. Design year traffic is estimated at 5300 to 7000 VPD with the Northeastern Loop in place. With the extension of Sigmon Road to the loop system at Startown Road and to existing NC 150, there will be an alternative route to East Main Street for travel across town. Therefore, it is recommended that this road be extended to Startown Road and to NC 150 as a two-lane, 24' facility (Cross-Section K,

Appendix D).

9, Startown Road (SR 1005) - Currently, this facility serves local traffic in the northern part of the planning area. It is recommended to extend Startown Road to Riverside Drive/NC 27 (Cross-Section K, Appendix D). This extension will operate with the extension of Motz Avenue to Riverside Drive to form a loop system to the west of the CBD. This loop system should provide relief to many of the facilities leading into the CBD area and within the CBD area itself. Design year volumes are expected to be 7000 VPD. It is also recommended to re-align Startown Road when the Northwest Loop is constructed (Cross-Section K, Appendix D). To the north of the Northwest Loop, Startown would be re-aligned to meet with Sigmon Road. No improvements to existing Startown Road are recommended.

10. Sycamore Street - This facility parallels Main Street and serves east-west movement through the CBD. Year 2020 traffic volumes are anticipated to be 2000 to 7200 VPD. Improvements are not recommended except at the extensions to Main Street on the east and west ends (Cross-Section I, Appendix D). These extgensions will improve traffic flow through the CBD area.

11. Water Street - This facility parallels Main Street Avenue and serves east-west movement through the CBD. Year 2020 traffic volumes are anticipated to be 1000 to 3800 VPD. Improvements are not recommended except at the extensions to Main Street on the east and west ends (Cross-Section I, Appendix D). These extensions will improve traffic flow through the CBD area.

Minor Thoroughfares

In addition to the proposed improvements recommended above, there are several facilities which have been designated as minor thoroughfares which comprise the remainder of the thoroughfare system. Minor thoroughfares differ from major ones primarily by being the initial or final link in a trip route (collector) rather than an intermediate one (arterial). This means that these facilities are more oriented towards providing land access to an area rather than moving traffic through it. Minor thoroughfares with anticipated design year traffic given the plan's implementation are listed below:

1. Asbury Church Road (SR 1354) - A grade separation is proposed where the Northeast Loop crosses this road when it is constructed. No other improvements are recommended.

2. Bethel Church Road (SR 1282) - This facility is expected to carry 6400 VPD of local traffic by design year. No improvements are recommended.

3. Bonview Avenue - Just north of the CBD and design year volumes of 6000 VPD, no improvements are recommended.

4. Cedar Street - It is a north-south facility that goes through the eastern part of the CBD. No improvements are recommended.

5. Confederate Road (SR 1222) - This facility is in the southern portion of the planning area. No improvements are recommended.

6. Country Club Road (SR 1262) - This facility presently carries a significant amount of residential commute and shopping traffic. However, improvements are not recommended as the facility is sufficient for design year volumes of 8000 VPD.

7. Crouse Road (SR 1228) - This road is an important road to local traffic in the southwest planning area. It offers an alternative route to Cherryville Highway in this vicinity. No improvements are recommended.

8. Dixon Street - No improvements are recommended.

9. Fork Road (SR 1248/1243) - With design year volumes of 2500 VPD, no improvements are recommended.

10. Hill Road (SR 1321) - No improvements are recommended to this facility which links Salem Church Road and NC 27. A grade separation with the Proposed NC 73 Extension is recommended when it is constructed.

11. Hilltop Road (SR 1225) - This facility serves local traffic southwest of the CBD. Along with Confederate Road this facility allows continuous access between NC 27 West and NC 150. With design year volumes of 2300 VPD, no improvements are recommended.

12. Huss Street (SR 1225) - This road serves local traffic. Year 2020 traffic is expected to be around 5000 VPD. No improvements are recommended.

13. Laboratory Road (SR 1238/1253/1252) - This facility serves mostly as a commute and shopping route from residences south of downtown Lincolnton. Improvements are not recommended.

14. Lithia Inn Road (SR 1294) - This facility presently carries a significant amount of residential commute and shopping traffic. Volumes are expected to be between 2400 and 4000 VPD in the year 2020. Improvements are not recommended.

15. Long Shoals Road (SR 1242) - No improvements are recommended.

16. Madison Street (SR 1222) - No improvements are recommended.

17. NC 73 - No improvements are recommended.

18. Riverview Road (SR 1236) - Design year volumes of 6300 VPD are expected. No improvements are recommended.

19. Southside Road (SR 1243) - No improvements are recommended

20. SR 1282 - See Startown Road.

21. Victory Grove Church Road (SR 1298) - No improvements are recommended.

22. Walker Branch Road (SR 1333) - No improvements are recommended.

23. Woodlie Road (SR 1335) - No improvements are recommended.

IX. IMPLEMENTATION

Implementation is one of the most important aspects of the Thoroughfare Plan. Unless implementation is an integral part of this process, the effort and expense associated with developing the plan is lost. There are several tools available for use by the City to assist in implementation of the Thoroughfare Plan. They are as follows:

State-Municipal Adoption of the Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides that after development of the Thoroughfare Plan, the Plan may be adopted by the governing body of the municipality and the Board of Transportation as the basis for future street and highway improvements. The mutually approved plan may then serve as a guide for the Department of Transportation in development of the road and highway system for the City. The approval of the plan by the City of Lincolnton also enables standard road regulations and land use controls to be used effectively in the implementation of this plan. As part of the Plan, the City of Lincolnton and the North Carolina Department of Transportation shall reach agreement on the responsibilities for existing and proposed streets and highways. Facilities which are designated a State responsibility will be constructed and maintained by the Division of Highways while facilities which are designated a municipal responsibility will be constructed and maintained by the municipality.

A public hearing was conducted by the Lincolnton City Council on July 11, 1996 to allow for additional public comments on the Thoroughfare Plan. As a result, the Plan was unanimously adopted. Additional public input included conduction of a formal goals and objectives survey. The results of this survey were analyzed and used during development of the recommended thoroughfare plan (See Appendix B).

On July 11, 1996, the City of Lincolnton City Council adopted the Lincolnton Thoroughfare Plan Map dated July 11, 1996. Thereafter on December 6, 1996, the North Carolina Board of Transportation formally adopted the Lincolnton Thoroughfare Plan.

Mutual adoption of the Thoroughfare Plan enables public officials to use planning tools available to them for implementation of the plan. These include: City of Lincolnton funding, Federal revenue sharing or block grants, urban bonds, redevelopment, zoning ordinances, advance purchase of rights-of- way, subdivision ordinances (see Appendix C for recommended subdivision ordinances), future street line ordinances, official street maps, and lobbying for state construction.

Subdivision Controls

Subdivision regulations require every subdivider to submit to the County Planning Commission a plan of any proposed subdivision. It also requires that subdivisions be constructed to certain standards. Through this process, it is possible to require subdivision streets to conform to the Thoroughfare Plan and to require reservation or protection of necessary right-of- way for projected streets and highways that are to become a part of the Thoroughfare Plan. The construction of subdivision streets to adequate standards reduces maintenance costs and simplifies the transfer of streets to the State Highway System. Appendix

C outlines the recommended subdivision design standards as they pertain to road construction.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient setbacks to provide for adequate sight distances and by requiring off-street parking.

Development Reviews

Driveway access to a State-maintained street or highway is reviewed by the District Engineer and by the Traffic Engineering Branch of the North Carolina Department of Transportation. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast food restaurants, or large industries) may be comprehensively studied by staff from the Traffic Engineering Branch, Planning and Environmental Branch, and/or Roadway Design Unit of NCDOT. If done at an early stage, it is often possible to significantly improve the development's accessibility while preserving the integrity of the Thoroughfare Plan.

Funding Sources

Capital Improvements Program

A capital improvement program makes it easier to build a planned thoroughfare system. This capital improvement program consists of two lists of projects. The first is a list of highway projects that are designated as municipal responsibility and are to be implemented with municipal funds. The second is a list of local projects designated as State responsibility to be included in the Transportation Improvement Program. (See Table 10 for recommended sources of funds and methods for implementation of projects.)

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document which lists all major construction projects the Department of Transportation plans for the next seven years. Similar to local capital improvement program projects, TIP projects are matched with projected funding sources. Every two years when the TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added.

Table 10
Funding Sources and Methods Recommended for Implementation of Projects

	Funding Sources				Methods of Implementation				
Project	Local Funds	TIP funds	Indust. Access	Small Urban	T-Fare Plan	Subdiv. Ord.	Zoning Ord.	Future Street Lines	Devel'mt Review
US 321 Widening		X			X				
NC 150 Widening		X			X				
NC 27 E. Widening		X			X				
NC 155 S. Widening		X			X				
Northeast Loop		X			X				
Northwest Loop		X			X				
Motz Street Extension	X				X				
Aspen Street Widening		X			X				
Cherryville Hwy Widening		X			X				
Grove Street Widening	X				X				
NC 27 West Widening		X			X				
NC 73 Extension		X			X				
NC 155 Widening		X			X				
Riverside Dr. Widening		X			X				
Salem Ch. Rd. Widening		X			X				
Sigmon Rd. Extensions			X						X
SR 1282 New Location				X	X				
Sycamore St. Extension	X								X
US 321 Widening		X			X				
Water St. Extensions		X			X				

There will be bi-annual TIP public hearings during which municipalities request projects to be included in the TIP. The year following the TIP public hearings, public input will be gathered for the draft TIP. A Board of Transportation member reviews all of the project requests in a particular area of the State. Based on the technical feasibility, project purpose and need, and available funding, the board member decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement projects, highway safety projects, public transit projects, railroad projects, and bicycle projects.

Industrial Access Funds

If an industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

Small Urban Funds

Small Urban Funds are annual discretionary funds made to municipalities with qualifying projects. The maximum amount is one million dollars per year per Division. A City may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 with four major goals for North Carolina's roads and highways. These goals are:

1. Complete the remaining 1,716 miles of four lane construction on the 3,600 mile North Carolina Intrastate System.

2. Construct a multilane connector in Asheville and portions of multilane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.

3. Supplement the secondary roads appropriation in order to pave, by 1999, 10,000 miles of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.

4. Supplement the Powell Bill Program.

In this 280-year planning period, the City of Lincolnton should look forward to the paving of most, if not all, of its unpaved roads on the State maintained system.

For more information on the Highway Trust Fund Law, contact the Program Development Branch of the North Carolina Department of Transportation.

APPENDIX A

PLANNING AREA HOUSING AND EMPLOYMENT DATA

Table A-1

Number of Dwelling Units in 1992

Zone	EXC	AAV	AVE	BA	Poor	Total
1	0	3	61	125	14	203
2	0	4	22	7	2	35
3	0	1	12	34	5	52
4	0	4	56	109	4	173
5	2	4	56	60	12	134
6	4	20	23	14	3	64
7	1	8	51	20	2	82
8	0	0	107	38	5	150
9	4	35	135	17	2	193
10	0	4	56	88	58	206
11	0	21	75	37	1	134
12	0	3	132	47	1	183
13	0	34	34	13	0	81
14	0	2	75	25	2	104
15	0	0	1	2	0	3
16	0	0	16	17	2	35
17	0	2	77	14	0	93
18	0	1	26	24	1	52
19	0	0	26	17	1	44
20	1	3	61	118	3	186
21	0	1	19	29	12	61
22	0	1	20	66	10	97
23	1	8	67	98	31	205
24	5	18	4	0	0	27
25	1	26	55	2	0	84
26	0	15	26	4	0	45
27	0	0	120	291	40	451
28	0	0	4	2	0	6
29	0	0	4	6	0	10
30	0	0	15	156	6	177
31	0	0	59	4	96	159
32	0	7	69	59	5	140
33	0	15	86	57	3	161
34	0	0	34	108	8	150
35	0	10	62	85	2	159
36	2	23	102	46	3	176
37	0	0	111	11	0	122
38	0	0	1	1	0	2
39	0	0	24	22	0	46
40	2	5	115	53	3	178
41	0	4	80	35	5	124
42	0	17	39	17	1	74
43	0	0	1	2	21	24

Number of Dwelling Units in 1992 (cont.)

Zone	EXC	AAV	AVE	BA	Poor	Total
44	0	0	21	57	66	144
45	0	0	21	130	29	180
46	0	9	36	50	2	97
47	0	0	13	9	0	22
48	0	2	21	29	3	55
49	0	1	17	30	3	51
50	0	0	12	64	13	89
51	0	1	17	19	2	39
52	0	0	27	53	18	98
53	1	3	61	77	10	152
54	0	2	22	23	7	54
55	0	8	50	47	3	108
56	2	1	11	13	4	31
57	0	2	99	11	3	115
58	0	4	60	27	6	97
59	0	49	312	66	17	444
60	0	0	117	74	7	198
61	0	3	3	29	1	36
_Totals	26	384	3139	2788	558	6895

Table A-2

Number of Dwelling Units Projected in 2020

Zone	EXC	AAV	AVE	BA	Poor	Total
1	2	15	111	134	16	278
2	1	8	38	10	2	59
3	0	3	18	35	5	61
4	2	14	99	117	5	237
5	3	8	73	63	13	160
6	5	25	43	18	4	95
7	2	12	67	23	3	107
8	1	7	136	43	6	193
9	8	58	233	34	5	338
10	3	22	130	101	60	316
11	2	29	109	43	2	185
12	3	19	200	59	3	284
13	1	41	64	18	1	125
14	2	10	109	31	3	155
15	1	3	14	4	0	22
16	0	2	25	19	2	48
17	1	8	101	18	1	129
18	1	7	53	29	2	92
19	1	4	43	20	2	70
20	4	18	125	129	5	281
21	1	5	34	32	12	84
22	1	6	39	69	11	126
23	3	20	118	107	33	281
24	6	23	23	4	1	57
25	3	37	99	10	1	150
26	1	19	43	7	1	71
27	5	27	230	311	43	616
28	0	0	6	2	0	8
29	0	1	9	7	0	17
30	2	11	59	164	7	243
31	2	9	98	11	97	217
32	1	14	97	64	6	182
33	1	23	117	63	4	208
34	1	5	53	111	9	179
35	1	18	94	91	3	207
36	3	29	124	50	4	210
37	0	1	117	12	0	130
38	0	1	6	2	0	9
39	1	3	36	24	0	64
40	4	13	149	59	4	229
41	3	16	113	43	7	182
42	0	18	41	17	1	77
43	0	1	4	3	21	29

Number of Dwelling Units Projected in 2020 (cont.)

Zone	EXC	AAV	AVE	BA	Poor	Total
44	1	5	39	60	67	172
45	1	6	44	134	30	215
46	0	10	38	51	2	101
47	0	0	14	9	0	23
48	1	7	42	33	4	87
49	1	4	30	32	3	70
50	1	8	45	70	14	138
51	1	7	41	23	3	75
52	4	21	118	69	21	233
53	8	38	211	104	14	375
54	5	28	134	43	10	220
55	8	53	242	81	9	393
56	6	21	97	28	7	159
57	7	40	263	40	8	358
58	8	46	240	59	11	364
59	17	138	691	133	28	1007
60	9	50	332	112	13	516
61	1	6	17	31	1	56
_Totals	161	1101	6138	3323	650	11373

Table A-3

1992 Employment Data

Zone	Industrial	Retail	Hwy Retail	Office	Service	Total
1	55	15	0	1	9	80
2	0	1	1	0	50	52
3	173	2	0	0	1	176
4	15	1	0	0	10	26
5	3	5	17	0	14	39
6	20	0	0	0	2	22
7	3	6	12	0	20	41
8	0	0	2	0	0	2
9	10	80	0	0	18	108
10	0	20	0	0	10	30
11	4	120	0	37	42	203
12	0	0	0	0	1	1
13	0	4	1	0	2	7
14	39	0	112	0	0	151
15	0	0	0	0	3	3
16	5	24	6	0	38	73
17	35	0	0	0	5	40
18	0	0	0	0	17	17
19	106	12	3	0	14	135
20	12	1	0	1	3	17
21	0	22	2	5	7	36
22	654	3	0	0	1	658
23	20	9	2	0	14	45
24	21	0	0	0	51	72
25	0	0	0	0	0	0
26	1127	0	0	0	18	1145
27	512	141	19	65	100	837
28	25	155	59	117	27	383
29	465	376	87	8	295	1231
30	1347	44	41	17	61	1510
31	335	0	0	5	2	342
32	224	11	0	0	282	517
33	2	9	6	0	22	39
34	25	0	0	0	8	33
35	20	39	0	12	105	176
36	2	2	0	0	13	17
37	0	29	32	0	87	148
38	79	8	8	4	625	724
39	159	135	192	16	147	649
40	0	0	0	0	1	1
41	2	2	0	0	5	9
42	56	40	42	189	115	442
43	2	98	106	4	111	321

1992 Employment Data (cont.)

Zone	Industrial	Retail	Hwy Retail	Office	Service	Total
44	0	0	0	9	8	17
45	7	0	0	1	28	36
46	30	0	3	37	9	79
47	13	174	3	300	114	604
48	0	0	1	2	0	3
49	2	2	0	0	6	10
50	25	3	0	10	4	42
51	469	1	0	0	3	473
52	22	3	0	0	7	32
53	65	3	0	0	6	74
54	0	23	0	0	2	25
55	206	48	0	0	8	262
56	0	0	0	0	1	1
57	11	79	0	1	13	104
58	14	13	22	0	10	59
59	0	2	7	0	17	26
60	0	1	5	0	25	31
61	0	0	0	0	0	0
Totals	6421	1766	791	841	2617	12436

Table A-4

2020 Employment Data Projections

Zone	Industrial	Retail	Hwy Retail	Office	Service	Total
1	54	30	3	1	20	108
2	0	1	4	0	71	76
3	937	2	2	0	14	955
4	15	1	6	0	59	81
5	3	5	27	10	102	147
6	20	0	5	0	43	68
7	3	11	22	21	71	128
8	0	0	6	0	0	6
9	10	118	6	0	115	249
10	0	20	10	0	39	69
11	4	213	15	76	165	473
12	0	0	5	0	7	12
13	339	68	55	30	234	726
14	429	79	170	30	201	909
15	340	49	39	0	92	520
16	434	107	60	54	185	840
17	363	39	30	94	212	738
18	237	10	15	49	96	407
19	104	41	18	30	56	249
20	12	1	5	1	13	32
21	0	49	12	10	12	83
22	954	3	10	0	6	973
23	20	19	12	0	33	84
24	21	0	5	0	93	119
25	0	0	4	0	3	7
26	1350	20	0	0	97	1467
27	505	287	48	168	312	1320
28	25	253	93	155	76	602
29	458	519	130	37	379	1523
30	1761	122	119	41	188	2231
31	433	20	20	39	51	563
32	221	26	20	54	435	756
33	2	14	16	0	26	58
34	25	0	8	0	16	49
35	20	48	17	49	191	325
36	2	2	0	0	19	23
37	0	38	46	21	110	215
38	78	42	23	38	746	927
39	157	176	239	70	306	948
40	0	0	0	0	1	1
41	2	6	0	0	5	13
42	55	55	57	257	176	600
43	2	114	130	24	198	468

2020 Employment Dat Projections (cont.)

Zone	Industrial	Retail	Hwy Retail	Office	Service	Total
44	0	0	0	12	11	23
45	7	0	0	6	39	52
46	30	0	3	46	15	94
47	13	188	3	356	155	715
48	0	0	3	2	0	5
49	2	2	3	0	12	19
50	25	3	5	20	34	87
51	812	11	12	123	208	1166
52	173	13	5	0	120	311
53	64	23	25	15	103	230
54	0	33	5	10	31	79
55	386	116	20	34	111	667
56	0	0	0	0	3	3
57	11	117	15	21	76	240
58	14	28	36	0	44	122
59	0	2	19	0	28	49
60	0	1	20	0	135	156
61	0	0	5	0	0	5
_Totals	10932	3145	1691	2004	6399	24171

APPENDIX B

GOALS AND OBJECTIVES SURVEY

APPENDIX B

GOALS & OBJECTIVES SURVEY DATA SUMMARY FOR LINCOLNTON

Survey Form

In order to determine the items of importance to the planning area, a "Goals and Objectives" survey was conducted. A one page survey was distributed to the residents in the planning area by the City of Lincolnton Planning Department to determine the local desires and priorities in the thoroughfare plan. The survey form was organized as follows: Thirty-two issues were rated from not important to most important in the areas of Environment, Neighborhood, Economy, and Transportation.

Summary procedure

The total number respondents were 153 out of 532 mailings. The number of most important responses for each issue were added. The results of the survey indicated that the transportation improvements of high priority were to increase traffic safety, attract new industry, protection of neighborhoods from truck traffic and landscape streets with trees and shrubs.

Thoroughfare Plan Survey Results

	Not Important	Important	Very Important	Most Important
Public Transit Service	53.6%	24.5%	13.9%	7.9%
One-Way Streets in Downtown Area	55.3%	26.0%	14.0%	4.7%
Traffic Routing to By-pass Downtown	28.2%	35.6%	21.5%	14.8%
Taxi Service	33.1%	37.7%	15.9%	13.2%
Residential Sidewalks	10.4%	27.3%	35.1%	27.3%
Parking in Downtown Area	4.0%	29.8%	39.1%	27.2%
Traffic Flow Improvements at Intersections	3.4%	29.7%	33.1%	34.5%
Bicycle Lanes, Routes and Pathways	33.1%	35.7%	16.2%	14.9%
Traffic Safety Near Parks and Playgrounds	3.9%	27.5%	32.0%	36.6%
Restriction of Access Along Major Roadways	15.0%	44.4%	27.5%	13.1%
Land Use Zoning To Minimize Traffic Congestion	17.1%	33.6%	30.8%	18.5%
Planting of Trees and Shrubs Along Streets	29.9%	37.7%	17.5%	14.9%
Access to Downtown Business District	9.8%	34.6%	30.1%	25.5%
Limitations of Billboards Along Highways	28.3%	24.3%	26.3%	21.1%
Traffic Safety	2.0%	19.1%	27.0%	52.0%

	Not Important	Important	Very Important	Most Important
Access to Shopping Centers	3.9%	44.7%	32.2%	19.1%
Off-Street Loading Areas for Trucks	10.0%	34.0%	32.0%	24.0%
Improved Safety at Railroad Crossings	2.0%	30.7%	27.1%	39.2%
Conditions of Roads and Bridges	1.4%	15.5%	38.5%	44.6%
Your Monthly Travel Costs	16.0%	31.3%	31.3%	21.5%
Noise Caused By Vehicles	17.9%	37.7%	29.1%	15.2%
Reduction of Traffic Congestion	6.7%	36.2%	30.9%	26.2%
Limitation of Commercial Signs	24.3%	30.9%	26.3%	18.4%
Traffic Safety Near School	3.3%	16.4%	20.4%	59.9%
Reduction of Vehicle Air Pollution	7.2%	30.3%	33.6%	28.3%
Home to Work Travel Time	18.8%	43.1%	22.9%	15.3%
Preservation of Historic Buildings	11.0%	33.8%	26.6%	28.6%
Traffic Safety Near Neighborhoods	4.6%	18.5%	33.8%	43.0%
Construction Costs of Transportation System	12.6%	29.1%	35.1%	23.2%
Designation of Truck Routes	6.0%	38.3%	29.5%	26.2%

	Not Important	Important	Very Important	Most Important
Limitation of Commercial Development Along Thoroughfares	27.0%	33.8%	25.0%	14.2%
Transportation System Improvements to Attract More Industry	3.2%	21.3%	27.7%	47.7%

APPENDIX C

RECOMMENDED SUBDIVISION ORDINANCES

Appendix C

Recommended Subdivision Ordinances

Definitions

Streets and Roads

Rural Roads

1. *Principal Arterial* - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

2. *Minor Arterial* - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.

3. *Major Collector* - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.

4. *Minor Collector* - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.

5. *Local Road* - A road which serves primarily to provide access to adjacent land, over relatively short distances.

Urban Streets

1. *Major Thoroughfares* - Major thoroughfares consist of Inter-state, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. *Minor Thoroughfares* - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.

3. *Local Street* - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

1. *Freeway, expressway, or parkway* - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A *freeway* provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An *expressway* is a facility with full or partial control of access and generally with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.

2. *Residential Collector Street* - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. *Local Residential Street* - Cul-de-sacs, loop streets less than 760 meters (2500 ft) in length, or streets less than 1.6 kilometers (1.0 miles) in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. *Cul-de-sac* - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

5. *Frontage Road* - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

6. *Alley* - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

Property

Building Setback Line

A line parallel to the street in front of which no structure shall be erected.

Easement

A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

Lot

A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

Subdivision

Subdivider

Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

Subdivision

All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets.

The following shall not be included within this definition nor subject to these regulations.

* The combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein
* the division of land into parcels greater then 4 hectares (10 acres) where no street right-of-way dedication is involved

* the public acquisition, by purchase, of strips of land for the widening or the opening of streets
* the division of a tract in single ownership whose entire area is no greater than 0.8 hectares (2 acres) into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

Dedication

A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

Reservation

Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

Streets and Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the municipality. The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

Right-of-way Widths

Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where (ROW) requirements have been specifically set out in the Thoroughfare Plan.

The subdivider will only be required to dedicate a maximum of 30 meters (100 ft) of right-of-way. In cases where over 30 meters (100 ft) of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 30 meters (100 ft). On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less then 18 meters (60 ft) in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated.

Table C-1

Minimum Right-of-way Requirements

Area Classification	Functional Classification	Minimum ROW
RURAL	Principle Arterial	Freeways- 105 m (350 ft) Other- 60 m (200 ft)
	Minor Arterial	30 m (100 ft)
	Major Collector	30 m (100 ft)
	Minor Collector	24 m (80 ft)
	Local Road	18 m[1] (60 ft)
URBAN	Major Thoroughfare	27 m (90 ft)
	Minor Thoroughfare	21 m (70 ft)
	Local Street	18 m[1] (60 ft)
	Cul-de-sac	variable[2]

[1]The desirable minimum right-of-way (ROW) is 18 meters (60 ft). If curb and gutter is provided, 15 meters (50 ft) of ROW is adequate on local residential streets.

[2]The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

Street Widths

Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. *Local Residential*

    * Curb and Gutter section
        * 7.8 meters (26 ft), face to face curb
    * Shoulder section
        * 6.0 meters (20 ft) to edge of pavement, 1.2 meters (4 ft) for shoulders

2. Residential Collector

    * Curb and Gutter section
        * 10.2 meters (34 ft), face to face of curb
    * Shoulder section
        * 6.0 meters (20 ft) to edge of pavement, 1.8 meters (6 ft) for shoulders

Geometric Characteristics

The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-way shall apply.

1. *Design Speed* - The design speed for a roadway should be a minimum of 10 km/h (5 mph) greater than the posted speed limit. The design speeds for subdivision type streets are shown in Tables D-2 (metric) and D-3 (english).

2. *Minimum Sight Distance* - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provide and calculated using the parameters set forth in Tables D-4 (metric) and D-5 (english).

3. *Superelevation* - Tables D-6 (metric) and D-7 (english) show the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

4. *Maximum and Minimum Grades*

    * the maximum grades in percent are shown in Table D-8 (metric) and D-9 (english)
    * minimum grade should not be less then 0.5%
    * grades for 30 meters (100 ft) each way from intersections (measured from edge of pavement) should not exceed 5%

Table C-2

Design Speeds (Metric)

Facility Type	Design Speed (km/h) Desirable	Minimum Level	Minimum Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	100	80	60
Local Roads[1] (ADT Over 400)	80	80	60
URBAN			
Major Thoroughfares[2]	100	60	60
Minor Thoroughfares	100	50	50
Local Streets	50	50	30

[1]Local Roads including Residential Collectors and Local Residential.

[2]Major Thoroughfares other than Freeways or Expressways.

Table C-3

Design Speeds (English)

Facility Type	Design Speed (mph) Desirable	Minimum Level	Minimum Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	60	50	40
Local Roads[1] (ADT Over 400)	50	*50	*40
URBAN			
Major Thoroughfares[2]	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

Note: *Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce minimum design speed. **Based on projected ADT of 50-250. (Reference NCDOT Roadway Design Manual page 1-1B)

[1]Local Roads including Residential Collectors and Local Residential.

[2]Major Thoroughfares other than Freeways or Expressways.

Table C-4

Sight Distance (Metric)

Design Speed (km/h)	Stopping Sight Distance (meters) Desirable	Minimum	Minimum K[1] Values (meters) Crest Curve	Sag Curve	Passing Sight Distance (meters) For 2-lanes
30	30	29.6	3	4	*
50	70	57.4	9	11	*
60	90	74.3	14	15	*
90	170	131.2	43	30	*
100	210	157.0	62	37	*

Note: General practice calls for vertical curves to be multiples of 10 meters. Calculated lengths shall be rounded up in each case. *Minimum passing distance for 2-lanes is currently under revision. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-1)

[1]K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

Table C-5

Sight Distance (English)

Design Speed (mph)	Stopping Sight Distance (feet)		Minimum K[1] Values (feet)		Passing Sight Distance (feet)
	Desirable	Minimum	Crest Curve	Sag Curve	For 2-lanes
30	200	200	30	40	1100
40	325	275	60	60	1500
50	475	400	110	90	1800
60	650	525	190	120	2100

Note: General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case. (Reference NCDOT Roadway Design Manual page 1-12 T-1)

[1]K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

Table C-6

Superelevation Table (Metric)

Design Speed	Minimum Radius of Maximum e[1]		
	e=0.04	e=0.06	e=0.08
50	100	90	80
65	175	160	145
80	280	250	230
100	490	435	395

[1]e = rate of roadway superelevation, meter per meter.

Table C-7

Superelevation Table (English)

Design Speed (mph)	Minimum Radius of Maximum e[1]			Maximum Degree of Curve		
	e=0.04	e=0.06	e=0.08	e=0.04	e=0.06	e=0.08
30	302	273	260	19 00'	21 00'	22 45'
60	573	521	477	10 00'	11 15'	12 15'
80	955	955	819	6 00'	6 45'	7 30'
100	1,637	1,432	1,146	3 45'	4 15'	4 45'

[1]e = rate of roadway superelevation, foot per foot

Note: (Reference NCDOT Roadway Design Manual page 1-12 T-6 thru T-8)

Table C-8

Maximum Vertical Grade (Metric)

Facility Type and Design Speed (km/h)	Minimum Grade in Percent		
	Flat	Rolling	Mountainous
RURAL			
Minor Collector Roads*			
30	7	10	12
50	7	9	10
65	7	8	10
80	6	7	9
100	5	6	8
110	4	5	6
Local Roads*[1]			
30	-	11	16
50	7	10	14
65	7	9	12
80	6	8	10
100	5	6	-
URBAN			
Major Thoroughfares[2]			
50	8	9	11
65	7	8	10
80	6	7	9
100	5	6	8
Minor Thoroughfares*			
30	9	12	14
50	9	11	12
65	9	10	12
80	7	8	10
100	6	7	9
110	5	6	7
Local Streets*			
30	-	11	16
50	7	10	14
65	7	9	12
80	6	8	10
100	5	6	-

Note: *For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

[1]Local Roads including Residential Collectors and Local Residential.

[2]Major Thoroughfares other than Freeways or Expressways.

Table C-9

Maximum Vertical Grade (English)

Facility Type and Design Speed (km/h)	Minimum Grade in Percent		
	Flat	Rolling	Mountainous
RURAL			
Minor Collector Roads*			
20	7	10	12
30	7	9	10
40	7	8	10
50	6	7	9
60	5	6	8
70	4	5	6
Local Roads*[1]			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-
URBAN			
Major Thoroughfares[2]			
30	8	9	11
40	7	8	10
50	6	7	9
60	5	6	8
Minor Thoroughfares*			
20	9	12	14
30	9	11	12
40	9	10	12
50	7	8	10
60	6	7	9
70	5	6	7
Local Streets*			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-

Note: *For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

[1]Local Roads including Residential Collectors and Local Residential.

[2]Major Thoroughfares other than Freeways or Expressways.

Intersections

1. Streets shall be laid out so as to interest as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 60 meters (200 ft) between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than one hundred and fifty (150) meters (500 ft) in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are mode for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 6.0 meters (20 ft).

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead-end as may be required by the Planning Board.

Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 9.0 meters (30 ft) form the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 1.8 meters (6 ft) from the face of curb.

Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

   * shoulder section approach

      * under 800 ADT design year - minimum 8.4 meters (28 ft) width face to face of parapets, rails, or pavement width plus 3 meters (10 ft), whichever is greater.

      * 800 - 2000 ADT design year - minimum 10.2 meters (34 ft) width face to face of parapets, rails, or pavement width plus 3.6 meters (12 ft), whichever is greater

      * over 2000 ADT design year - minimum width of 12 meters (40 ft), desirable width of 13.2 meters (44 ft) width face to face of parapets or rails

   * curb and gutter approach

      * under 800 ADT design year - minimum 7.2 meters (24 ft) face to face of curbs

      * over 800 ADT design year - with of approach pavement measured face to face of curbs.

   * where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 450 millimeters (1' 6"), or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

   * shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (shoulder width 2.4 m (8 ft) minimum, 3 m (10 ft) desirable.)

   * curb and gutter approach - Width of approach pavement measured face to face of curbs.

APPENDIX D

TYPICAL CROSS SECTIONS

APPENDIX D

TYPICAL THOROUGHFARE CROSS-SECTIONS

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Typical cross section recommendations are shown in Figure 17 following this literature. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way. On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Recommendations for "ultimate" cross sections are provided for (1) thoroughfares which may require widening after the current planning period; (2) for thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient; and (3) for thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to maximum and minimum grades, minimum sight distances, maximum degree of curve and related superelevation, and other considerations for thoroughfares are given in Appendix D. This Appendix gives definitions and design standards recommended for inclusion in subdivision regulations.

Cross sections "A" and "L" is typical for controlled access freeways. The 14 m (46 ft) grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 70 m (228 ft) depending upon cut and fill requirements.

Cross section "B", seven lane curb and gutter, should not be used for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B"

should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

Cross section "C", five lane curb and gutter, is typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "D", "E", and "M" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections. The 4.9 m (16 ft) median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians may be used in urban areas. However, these types of medians result in greatly increased maintenance costs and an increased danger to maintenance personnel. Non- monolithic medians should only be recommended when the above concerns are addressed.

Cross section "F" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 7.3 m (24 ft) is recommended with 9.1 m (30 ft) being desirable.

Typical cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require **cross section "H". Cross sections "I" and "J"** are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. **Cross section "I"** would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

Cross section "K" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable

period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 30 m (100 ft) should be required. In some instances, local ordinances may not allow the full 30 m (100 ft). In those cases, 21 m (70 ft) should be preserved with the understanding that the full 30 m (100 ft) will be preserved by use of building setbacks and future street line ordinances.

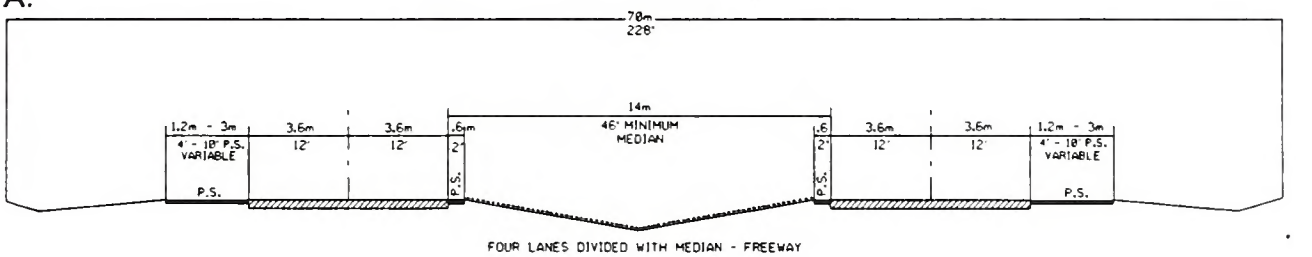
The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-ways shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. **Cross sections N, O, and P** are typically used to accommodate bicycle travel.

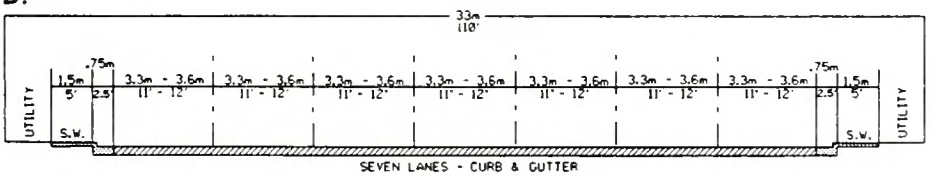
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



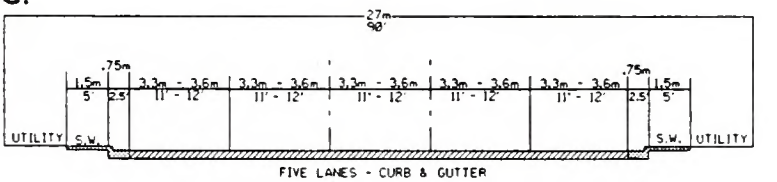
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



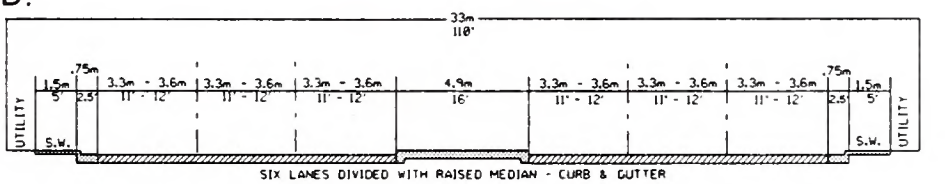
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

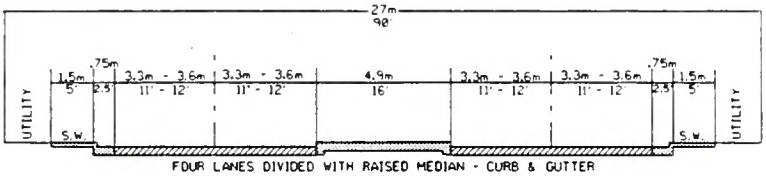
D.



SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

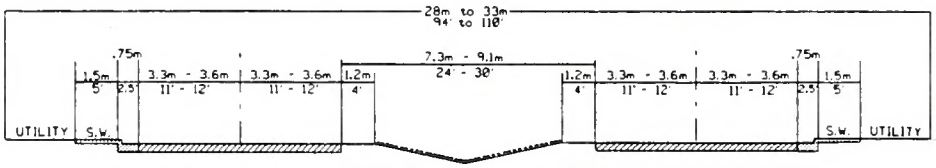
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



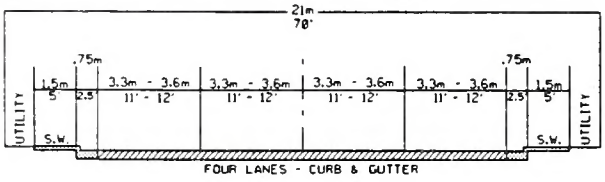
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



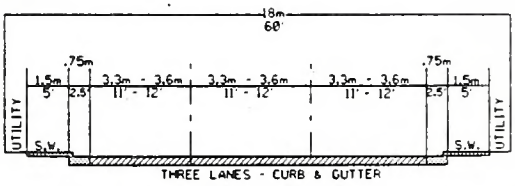
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



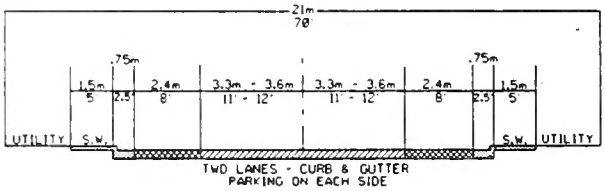
FOUR LANES - CURB & GUTTER

H.



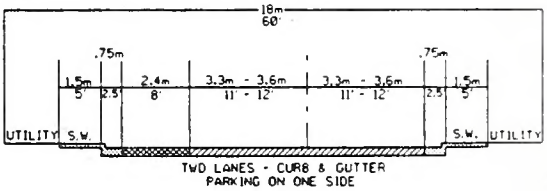
THREE LANES - CURB & GUTTER

I.



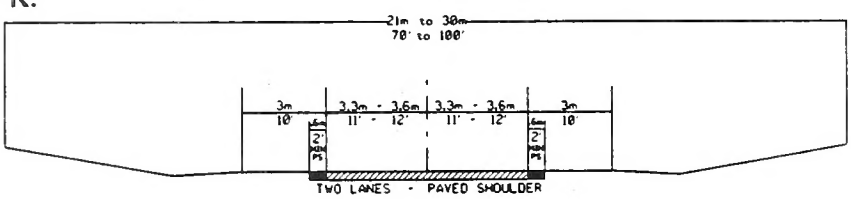
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

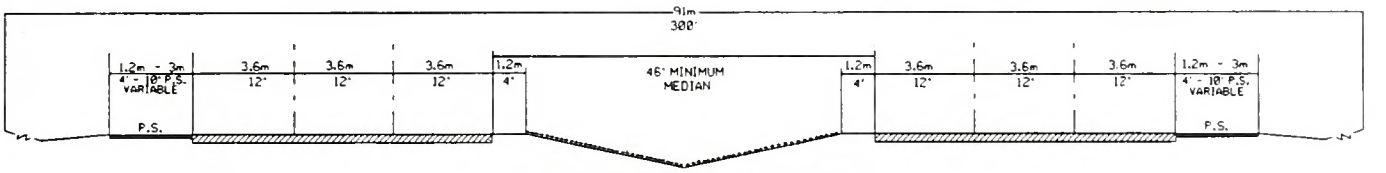
K.



TWO LANES - PAVED SHOULDER

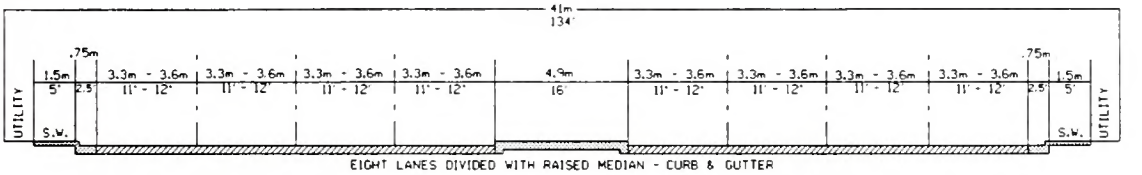
TYPICAL THOROUGHFARE CROSS SECTIONS

L.



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

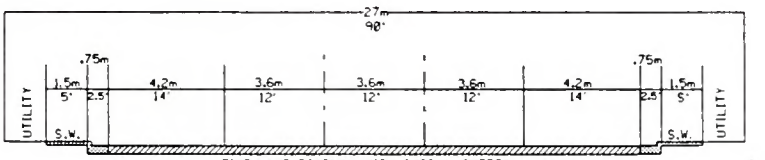
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

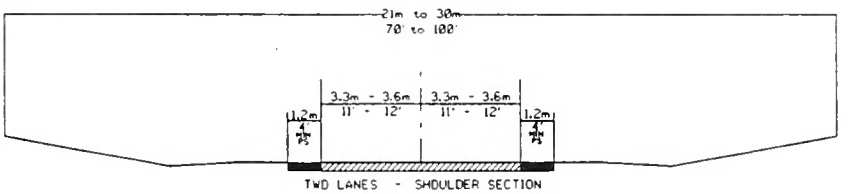
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



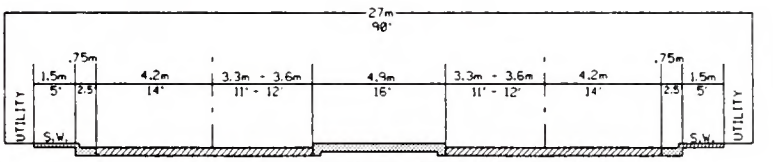
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

O.



TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

APPENDIX E

STREET TABULATION

The Street Tabulation consists of an alphabetized street listing, with base year and future year traffic, and the recommended cross section for each street.

Definitions:

Capacity	Capacity at Level of Service D
2020 ADT	Average weekday traffic (2020) on Thoroughfare Plan system
PAB	Planning Area Boundary
SCL	South City Limits
NCL	North City Limits
( )	Proposed facility
ADQ	Adequate
N/A	Not applicable

STREET - SECTION REFERENCE	DIST MI	EXISTING X-SECTION RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1992 ADTS	2020 ADTS	RECOMMENDED X-SECTION RDWAY (ULT)	ROW (ULT)
Asbury Church Rd (SR 1354)								
NC 27 - Bridgeport Lane	0.90	18	60	9500	1319	5000	ADQ	ADQ
Aspen Street								
North Aspen Street (SR 1405)								
Sycamore - Pine	0.06	45	60	21,600	3800	5000	ADQ	ADQ
Pine - Bonview	0.19	44	60	21,600	8200	12,000	ADQ	ADQ
Bonview - Dixon	0.28	44	60	21,600	9000	20,000	ADQ	ADQ
Dixon - City Limits	0.22	48	60	22,300	8250	18,000	ADQ	ADQ
City Limits - Flint Street	0.53	22	60	(20,000)	9100	18,000	G	70
Flint - Sigmon Road	0.23	22	60	(20,000)	10,050	18,000	G	70
Sigmon - Old US 321	0.25	22	60	(20,000)	9000	17,000	G	70
South Aspen Street (SR 1406)								
Water Street - Railroad	0.10	30	50	13,000	3300	5000	ADQ	ADQ
Railroad - Massapoag	0.45	30	50	13,000	4700	8900	ADQ	ADQ
Massapoag -SCL	0.22	30	50	13,000	4300	9600	ADQ	ADQ
SCL - Old US 321	0.70	22	60	11,000	3650	6000	ADQ	ADQ
Bethel Church Road (SR 1282)								
Spring Valley Ln - Buffalo Shoals	0.80	18	60	9500	3700	6400	ADQ	ADQ
Bonview Avenue								
N. Aspen - Battleground	0.08	26	40	12,000	1500	6000	ADQ	ADQ
Battleground - Grove Street	0.20	28	50	12,500	1500	6000	ADQ	ADQ
Buffalo Shoals Road (SR 1003)								
NC 27 E - Highland Drive	0.55	22	60	(35,000)	6200	12,000	C	90
NC 27 E - Bethel Church Road	0.95	22	60	11,000	6200	10,000	ADQ	ADQ
Bethel Church - PAB	1.00	22	60	11,000	5200	8000	ADQ	ADQ
Cedar Street								
Congress - Water	0.15	26	60	12,000	800	1200	ADQ	ADQ
Water - Main	0.05	40	60	15,000	1800	2000	ADQ	ADQ
Main - Sycamore	0.05	32	60	13,400	300	1500	ADQ	ADQ
Sycamore - McBee	0.14	26	60	12,000	1200	1400	ADQ	ADQ
McBee - Dixon	0.25	25	60	12,000	600	1000	ADQ	ADQ
Cherryville Hwy (SR 1407)								
Startown Road - Riverside (NC 27W)	0.80	--	--	(36,500)	--	7000	G	70
Riverside - Hilltop (SR 1225)	0.50	24	90	(37,500)	5000	12,500	C	ADQ
SR 1225 - SR 1231	1.00	24	90	(36,500)	5000	12,000	G	ADQ
SR 1231 - NC 150	0.54	23	60	(36,500)	4200	11,600	G	70
NC 150 - SR 1228	0.70	22	150	(36,500)	9800	20,300	G	ADQ
Confederate Road (SR 1222)								
NC 150 - SR 1252	0.78	20	60	11,000	900	2200	ADQ	ADQ
Congress Street								
Grove - Government	0.19	23	40	11,000	2000	3000	ADQ	ADQ
Government - Aspen	0.09	25	40	12,000	3050	4000	ADQ	ADQ
Aspen - Academy	0.09	36	40	14,000	5800	6500	ADQ	ADQ
Academy -Cedar	0.20	26	40	12,000	6400	7000	ADQ	ADQ
Cedar - Laurel	0.09	19	40	9500	4400	5000	ADQ	ADQ

STREET - SECTION REFERENCE	EXISTING X-SECTION DIST MI	RDWY FT	ROW FT	CAPCITY CURRENT (FUTURE)	1992 ADTS	2020 ADTS	RECOMMENDED X-SECTION RDWAY (ULT)	ROW (ULT)
Country Club Rd (SR 1262)								
Old US 321- Lithia Inn	0.89	24	60	12,000	4000	8000	ADQ	ADQ
Lithia Inn - US 321	0.30	24	60	12,000	4000	8000	ADQ	ADQ
US 321 - Salem Church Rd	1.00	24	60	12,000	4200	8000	ADQ	ADQ
Crouse Rd (SR 1228)								
NC 182 - Drive Inn Rd	1.25	18	60	9500	750	1700	ADQ	ADQ
Drive Inn Rd - NC 150	1.40	18	60	9500	500	1000	ADQ	ADQ
Dixon Street								
N. Aspen - Flint	0.45	29	40	12,500	500	1000	ADQ	ADQ
Flint Street								
North Flint Street (SR 1263)								
N. Aspen - Dixon	0.67	20	60	10,500	1000	1600	ADQ	ADQ
Dixon - Pine	0.35	18	60	9500	1000	1500	ADQ	ADQ
Pine - Main	0.10	18	60	9500	5000	6000	ADQ	ADQ
South Flint Street								
Main - Water	0.05	21	40	9500	2000	2500	ADQ	ADQ
Water - Lincoln	0.19	21	40	9500	2000	2500	ADQ	ADQ
Lincoln - Catawba	0.06	20	40	9500	2000	2500	ADQ	ADQ
Catawba - Laurel	0.11	19	40	9500	2000	2500	ADQ	ADQ
Laurel - Motz Ave. Ext	0.12	18	40	9500	100	2400	ADQ	ADQ
Fork Road								
SR 1248								
SR 1252 - SR 1243	1.08	18	60	9500	300	1800	ADQ	ADQ
SR 1243								
SR 1248 - Old US 321	0.30	18	60	9500	1250	2200	ADQ	ADQ
Government Street								
Bon View - Pine	0.14	18	60	8500	200	400	ADQ	ADQ
Pine - Main	0.11	45	60	22,000	4300	4800	ADQ	ADQ
Main - Water	0.06	35	60	14,000	500	800	ADQ	ADQ
Water - Church	0.05	31	60	13,000	1800	2400	ADQ	ADQ
Church - Congress	0.10	19	60	8500	500	800	ADQ	ADQ
Congress - Grier	0.07	24	60	12,000	1500	1900	ADQ	ADQ
Grier - Motz	0.34	18	50	8500	1500	1900	ADQ	ADQ
Grove Street								
North Grove Street (SR 1008)								
NCL - Victor Street	0.10	22	60	11,500	8900	10,000	ADQ	ADQ
Victor - Bonview	0.17	32	60	13,000	8500	10,000	ADQ	ADQ
Bonview - Sycamore	0.15	32	60	(26,000)	8500	14,000	C	90
Sycamore - Main Street	0.06	32	60	(26,000)	9300	14,000	C	90
South Grove Street (SR 1222)								
Main - Water	0.06	20	40	9500	3000	4000	ADQ	ADQ
Water - Madison	0.45	20	40	9500	2500	4000	ADQ	ADQ
Hill Road (SR 1321)								
NC 27 - SR 1323	0.50	18	60	9500	1000	1500	ADQ	ADQ
SR 1323 - Salem Church (SR 1001)	2.10	20	60	10,500	300	500	ADQ	ADQ

STREET - SECTION REFERENCE	EXISTING X-SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1992 ADTS	2020 ADTS	RECOMMENDED X-SECTION RDWAY (ULT)	ROW (ULT)
Hilltop Road (SR 1225)								
NC 182 - Cherryville Hwy	0.34	18	60	9500	1250	1500	ADQ	ADQ
Cherryville Hwy - Madison	0.55	18	60	9500	1750	2300	ADQ	ADQ
Huss Street (SR 1267)								
NC 27 - Sigmon Road	0.73	18	60	9500	1800	5000	ADQ	ADQ
Laboratory Road								
SR 1238								
Aspen - Motz Creek	0.08	18	60	9500	1100	2100	ADQ	ADQ
Motz Creek - SR 1257	0.13	22	60	12,000	1100	2100	ADQ	ADQ
SR 1257 - SR 1253	0.50	20	60	11,000	1100	2100	ADQ	ADQ
SR 1253								
SR 1238 - SR 1252	0.06	18	60	9500	1100	1500	ADQ	ADQ
SR 1252								
SR 1248 - Jerry Poovey Ln	0.45	18	60	9500	600	2300	ADQ	ADQ
Jerry Poovey Ln - SR 1253	0.60	20	60	11,000	600	2000	ADQ	ADQ
Laurel Street (SR 1262)								
Pine - Congress	0.30	24	60	12,000	1000	2600	ADQ	ADQ
Congress - Flint	0.22	48	110	22,000	5000	9500	ADQ	ADQ
Flint - US 321	0.38	48	110	22,000	6800	10,000	ADQ	ADQ
Lithia Inn Road (SR 1294)								
NC 27 - Railroad	0.21	24	60	12,500	1500	4000	ADQ	ADQ
Railroad - Country Club (SR1262)	0.95	18	60	8500	1500	4000	ADQ	ADQ
Country Club - SR 1298	0.80	18	60	8500	1500	2400	ADQ	ADQ
Long Shoals Road (SR 1242)								
Old US 321 - Hoffman Rd	0.80	20	60	11,000	1200	3700	ADQ	ADQ
Madison Street (SR 1222)								
Grove St. - SCL Lincolnton	0.25	20	40	11,000	3000	3700	ADQ	ADQ
SCL Lincolnton - NC 150	1.33	20	60	11,000	3000	3700	ADQ	ADQ
NC 150 - SR 1252	0.78	20	60	11,000	900	2200	ADQ	ADQ
Main Street (NC 27)								
East Main Street								
Court Square - Laurel	0.35	60	60	30,000	5600	8900	ADQ	ADQ
Laurel - Flint	0.17	26	40	12,000	9000	10,000	ADQ	ADQ
Flint - Abernethy	0.37	45	60	(26,000)	13,000	15,000	C	90
Abernethy - Newbolt	0.14	72	90	(26,000)	15,300	20,000	C	ADQ
Newbolt - US 321	0.73	59	70	(26,000)	26,600	23,000	C	90
West Main Street								
Court Square - N. High Avenue	0.15	24	60	12,000	9100	9800	ADQ	ADQ
N. High Avenue - Grove Street	0.`0	44	60	21,000	9100	14,000	ADQ	ADQ
Mooresville Hwy (NC 150 E.)								
NC 27 E - McAllister Road	0.61	24	60	(50,000)	9300	15,000	A	220
McAllister - Woodlie (SR 1335)	0.70	24	60	(50,000)	8500	20,000	A	220
SR 1335 - Old Mill Road	0.95	24	60	(50,000)	6400	17,000	A	220
Old Mill Rd - PAB	0.30	24	60	(50,000)	5800	15,000	A	220

STREET - SECTION REFERENCE	DIST MI	X-SECTION RDWY FT	X-SECTION ROW FT	CAPACITY CURRENT (FUTURE)	1992 ADTS	2020 ADTS	X-SECTION RDWAY (ULT)	X-SECTION ROW (ULT)
Motz Avenue								
(Riverside Drive - Madison St.)	0.50	--	--	(20,000)	--	7100	K(G)	70
Madison Street - Government St.	0.32	19	40	8500	500	7900	ADQ	ADQ
Government St. - Aspen	0.11	22	40	11,000	500	8300	ADQ	ADQ
(Aspen - Flint)	0.46	--	--	(12,000)	--	2600	K	70
NC 27 East (Charlotte Hwy)								
US 321 - Lithia Inn Rd	0.70	59	70	(55,000)	28,900	31,000	B	110
Lithia Inn Rd - Buffalo Shoals	0.40	59	70	(55,000)	23,400	28,000	B	110
Buffalo Shoals - NC 150	0.25	59	70	(55,000)	25,800	31,000	B	110
NC 150 - SR 1481	0.19	59	70	38,000	16,000	17,000	ADQ	ADQ
SR 1481 - NC 73	1.47	22	60	(40,000)	16,000	17,000	G	70
NC 73 - SR 1317	0.70	22	60	(40,000)	8300	12,000	G	70
SR 1317 - E. PAB	0.60	22	60	12,000	5300	8000	ADQ	ADQ
NC 27 West (Morganton Hwy)								
NC 182 - Proposed Northwest Loop	1.10	24	60	(40,000)	6200	15,000	C	90
Proposed Northwest Lp - W. PAB	0.20	24	60	13,000	6200	13000	ADQ	ADQ
NC 73								
NC 27 - E. PAB	1.00	20	60	11,000	5900	6800	ADQ	ADQ
(NC 73 Extension)								
(US 321 - Salem Church Rd)	0.95	--	--	(50,000)	--	40,000	A	220
(Salem Church Rd - Hill Road)	0.80	--	--	(50,000)	--	35,000	A	220
(Hill Road - NC 27)	0.90	--	--	(50,000)	--	35,000	A	220
(NC 27 - SR 1356)	0.80	--	--	(50,000)	--	27,000	A	220
NC 150								
Cherryville Hwy - S. Madison	0.92	24	150	(50,000)	7800	17,000	A	220
S. Madison - Laboratory	0.97	25	150	(50,000)	9600	23,000	A	220
(Laboratory - Old US 321)	2.10	--	--	(50,000)	--	22,000	A	220
NC 182								
NC 27 - SR 1228	0.20	18	60	9500	2900	7000	ADQ	ADQ
SR 1228 - Northwest Loop	1.00	18	60	9500	2100	7000	ADQ	ADQ
Northeast Loop								
(NC 73 Ext. - NC 27)	1.50	--	--	(54,000)	--	7600	K(A)	220
(NC 27 - Asbury Church)	0.70	--	--	(54,000)	--	9600	K(A)	220
(Asbury Church - NC 150)	1.50	--	--	(54,000)	--	9700	K(A)	220
(NC 150 - Shuford Rd)	0.40	--	--	(54,000)	--	2600	K(A)	220
Existing Shuford - Alberry Rd	0.60	18	60	(54,000)	1000	2600	K(A)	220
(Alberry - Buffalo Shoals)	0.50	--	--	(54,000)	--	2600	K(A)	220
(Buffalo Shoals - Bethel Church)	1.20	--	--	(54,000)	--	9700	K(A)	220
Existing Bethel Church - US 321	1.35	18	60	(54,000)	3900	16,000	K(A)	220
Northwest Loop								
(NC 150 - Cherryville Hwy)	0.60	--	--	(54,000)	--	6800	K(A)	220
(Cherryville Hwy - NC 182)	1.50	--	--	(54,000)	--	5500	K(A)	220
(NC 182 - NC 27)	0.20	--	--	(54,000)	--	6600	K(A)	220
(NC 27 - Reepsville Road)	1.40	--	--	(54,000)	--	7000	K(A)	220
(Reepsville Road - Startown Rd)	1.20	--	--	(54,000)	--	8700	K(A)	220
(Startown Rd - Sigmon Rd Ext.)	1.40	--	--	(54,000)	--	17,000	K(A)	220
(Sigmon Rd Ext. - Aspen Rd)	1.45	--	--	(54,000)	--	9800	K(A)	220
(Aspen Rd - US 321)	1.20	--	--	(54,000)	--	8400	K(A)	220
		EXISTING					**RECOMMENDED**	

STREET - SECTION REFERENCE	DIST MI	X-SECTION RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1992 ADTS	2020 ADTS	X-SECTION RDWAY (ULT)	ROW (ULT)
Old US 321 (NC 155)								
SR 1526 - SR 1298	2.30	22	60	(38,000)	10,100	14,500	C	90
SR 1298 - NC 150	0.14	22	60	(38,000)	12,400	17,000	C	90
NC 150 - SCL Lincolnton	0.63	24	150	(38,000)	13,700	18,000	C	ADQ
SCL Lincolnton - Montgomery	0.92	24	150	(38,000)	15,800	10,000	C	ADQ
Montgomery - NC 27/150	0.04	28	150	(38,000)	20,600	10,000	C	ADQ
NC 27/150 - SR 1405	1.29	24	150	(38,000)	17,800	14,000	C	ADQ
SR 1405 - NCL Lincolnton	0.41	40	60	(38,000)	13,600	15,000	C	90
NCL Lincolnton - 0.29 miles north	0.29	22	60	(38,000)	12,800	15,000	C	90
0.29 m. north CL - Bethel Church	0.06	30	40	(38,000)	12,800	15,000	C	90
Bethel Church - 0.18 miles north	0.18	36	40	(38,000)	10,000	12,000	C	90
0.18 m. north Bethel Ch - N.PAB	0.30	22	60	(38,000)	10,000	12,000	C	90
Pine Street								
Grove - Government	0.19	29	40	12,500	2250	3900	ADQ	ADQ
Government - Aspen	0.09	32	40	13,000	6800	8700	ADQ	ADQ
Aspen - Academy	0.09	22	40	11,000	6400	6700	ADQ	ADQ
Academy - Laurel	0.28	28	48	12,500	4400	4800	ADQ	ADQ
Laurel - Flint	0.17	29	40	12,500	4800	4900	ADQ	ADQ
Reepsville Rd (SR 1008)								
NCL Lincolnton - Startown	0.28	24	60	12,500	8900	10,000	ADQ	ADQ
Startown - N. PAB	0.601	20	60	10,500	4400	8000	ADQ	ADQ
Riverside Drive (NC 27)								
Grove St. - Water St. Ext.	0.15	44	60	(26,000)	9000	14,000	C	90
Water St. Ext. - NC 182	0.80	24	60	(26,000)	13,200	20,000	C	90
Riverview Road (SR 1236)								
NC 150 - SR 1554	0.75	18	60	9500	1900	6300	ADQ	ADQ
SR 1554 - SR 1252	0.85	18	60	9500	790	2700	ADQ	ADQ
Salem Church Road (SR 1001)								
NC 27E - SR 1483	0.15	24	60	(35,000)	4600	12,000	G	70
SR 1483 - Country Club	1.70	20	60	(35,000)	5400	12,500	G	70
Country Club - SR 1313	1.10	20	60	(35,000)	6100	14,000	G	70
Sigmon Road								
SR 1266								
Aspen - End	0.23	20	60	10,500	600	7000	ADQ	ADQ
(Extension to Startown)	0.85	--	--	(13,000)	--	7000	K	90
SR 1267								
Aspen - Old US 321	0.20	18	60	8000	3200	5700	ADQ	ADQ
Old US 321 - US 321	1.00	18	60	8000	2600	5300	ADQ	ADQ
US 321 - Huss Street	0.60	18	60	8000	1200	5300	ADQ	ADQ
(Huss Street - Buffalo Shoals)	0.70	--	--	(13,000)	--	4500	K	90
(Buffalo Shoals - Moorseville Hwy)	0.45	--	--	(13,000)	--	2700	K	90
Southside Road (SR 1243)								
SR 1248 - Peakwood Lane	1.75	18	60	9500	1000	2100	ADQ	ADQ
SR 1282								
(New Location at NW Loop-Aspen)	0.05			(13,000)	--	7000	K	70
New Location - Clarks Creek	0.70	20	60	11,000	3400	5000	ADQ	ADQ

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STREET - SECTION REFERENCE	DIST MI	EXISTING X-SECTION RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1992 ADTS	2020 ADTS	RECOMMENDED X-SECTION RDWAY (ULT)	ROW (ULT)
Startown Road (SR 1005)								
(Riverside Drive - Reepsville Rd)	0.80	--	--	(22,000)	--	7100	K(G)	70
Reepsville Rd - Proposed NW Loop	1.30	24	60	12,500	4600	9000	ADQ	ADQ
Proposed NW Loop - Clarks Creek	0.90	24	60	12,500	4600	9000	ADQ	ADQ
Sycamore Street								
(Extension to Riverside Drive)	0.13	--	--	(8000)	--	4300	1	70
End - Grove	0.04	18	40	8000	100	4700	1	70
Grove - High	0.10	23	40	11,000	4400	6000	ADQ	ADQ
High - Government	0.09	28	40	13,000	4400	7000	ADQ	ADQ
Government - N. Aspen	0.07	29	40	13,000	4950	7200	ADQ	ADQ
N. Aspen - Academy	0.09	28	40	13,000	2300	2800	ADQ	ADQ
Academy - Cedar	0.21	29	40	13,000	2300	2800	ADQ	ADQ
Cedar - Laurel	0.09	26	40	12,000	1000	2000	ADQ	ADQ
Sycamore Street (continued)								
Laurel - Flint	0.17	18	40	8000	500	1500	I	70
(Connector to E. Main)	0.10	--	--	(8000)	--	2800	1	70
US 321								
S. PAB - Proposed NC 150 Reloc.	1.50	24	300	(81,000)	N/A	40,000	L	ADQ
Prop. NC 150 Reloc. - Country Club	0.65	24	300	(81,000)	N/A	46,000	L	ADQ
Country Club - Lithia Inn Rd	0.60	24	300	(81,000)	N/A	46,000	L	ADQ
Lithia Inn Rd - NC 27/150	0.70	24	300	(81,000)	N/A	46,000	L	ADQ
NC 27/150 - Sigmon Road	0.80	24	300	(81,000)	N/A	36,000	L	ADQ
Sigmon Road - Bethel Church Rd	0.95	24	300	(81,000)	N/A	36,000	L	ADQ
Bethel Church Rd - N. PAB1	0.50	24	300	(81,000)	N/A	36,000	L	ADQ
Victory Grove Church Rd (SR 1298)								
Old US 321 - Lithia Inn Rd	0.76	18	60	9500	1500	3700	ADQ	ADQ
Water Street								
(Ext. to West Main)	0.04	--	--	(12,000)	--	2900	1	70
End to Grove St.	0.09	19	40	8000	60	3600	ADQ	ADQ
Grove - High	0.10	17	40	8000	1100	3700	ADQ	ADQ
High - Government	0.09	18	40	8000	1500	3800	ADQ	ADQ
Government - S. Aspen	0.07	32	40	13,000	700	3400	ADQ	ADQ
S. Aspen - Cedar	0.29	26	40	12,500	700	1700	ADQ	ADQ
Cedar - Laurel	0.09	20	40	9500	1300	2000	ADQ	ADQ
Laurel - Oak	0.09	18	40	8000	1300	2000	ADQ	ADQ
Oak - Flint	0.08	19	40	8500	700	1000	ADQ	ADQ
(Connector to E. Main)	0.10	--	--	(12,000)	--	1900	1	70
Walker Branch Rd (SR 1333)								
Sigmon Rd - Bethel Church Rd	1.00	18	60	9500	400	3500	ADQ	ADQ
Woodlie Road (SR 1335)								
Buffalo Shoals Rd - NC 150	0.90	18	60	9500	1800	5000	ADQ	ADQ